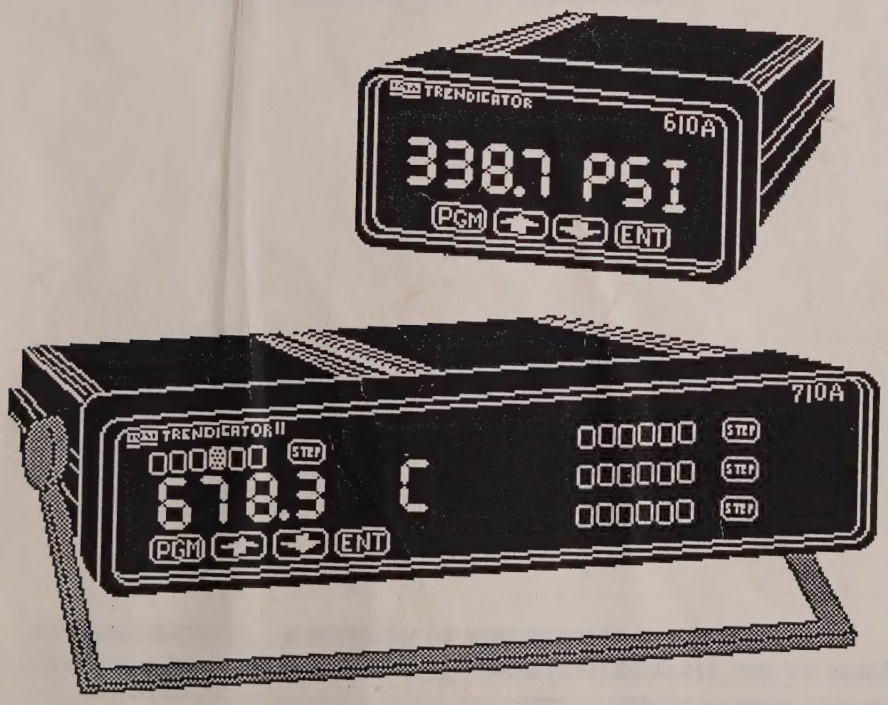
DORIC

Trendicator® II

Series 600 and Series 700 Digital Indicators



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MAINTENANCE MANUAL

TRENDICATOR® II
Series 600 and Series 700 Digital Indicators

Maintenance Manual

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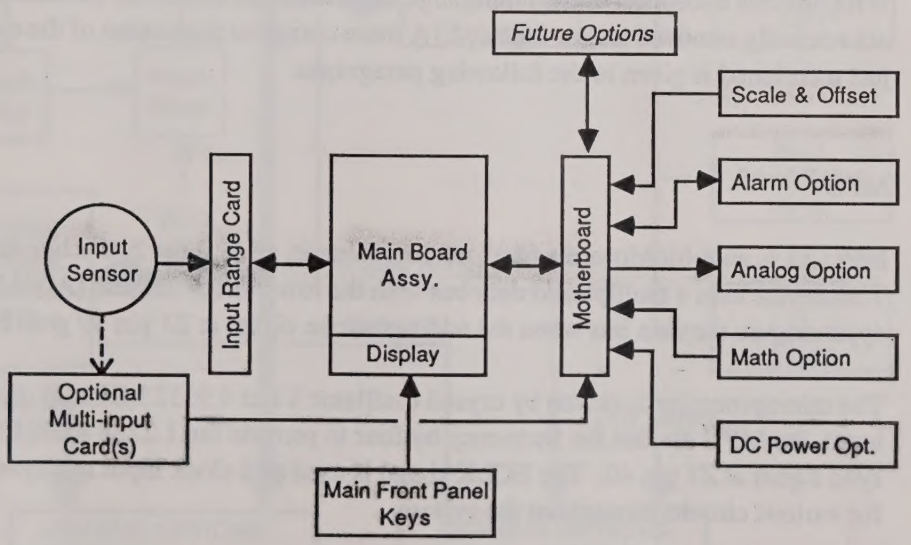
Chapter 1
Theory of Operation

1.1 INTRODUCTION TO THE THEORY OF OPERATION

In this chapter, we provide a technical discussion on how the indicator circuitry operates. This discussion is geared to readers with a technical background in electronics. The information presented should help in understanding the indicator when troubleshooting.

1.2 OVERVIEW

The basic indicator is composed of two circuit board assemblies: the main board assembly and an input range card. Motherboards are used to interconnect plug-in option cards to the main board circuits. The overall block diagram below shows the relationship of the electronic assemblies in the indicator system.



OVERALL BLOCK DIAGRAM OF THE INDICATOR

1.3 MAIN BOARD ASSEMBLY, GENERAL

Assembly: 605-4300-xx
Schematic: 605-6300-xx

A functional block diagram of the indicator system is given on the next page. Most of the functional blocks shown reside on the main board assembly.

The main board includes three sub-assemblies, (1) the vertically oriented display board, (2) the brother board, and (3) the input range card.

- The display board contains the display circuits plus the program lock-out switch and the cable connector for the main front panel keys. A soldered-in flat cable provides the interconnection between the display board and main board.

- The brother board is a plug-on board that contains most of the address decode and control logic plus the watch dog and reset driver circuits.

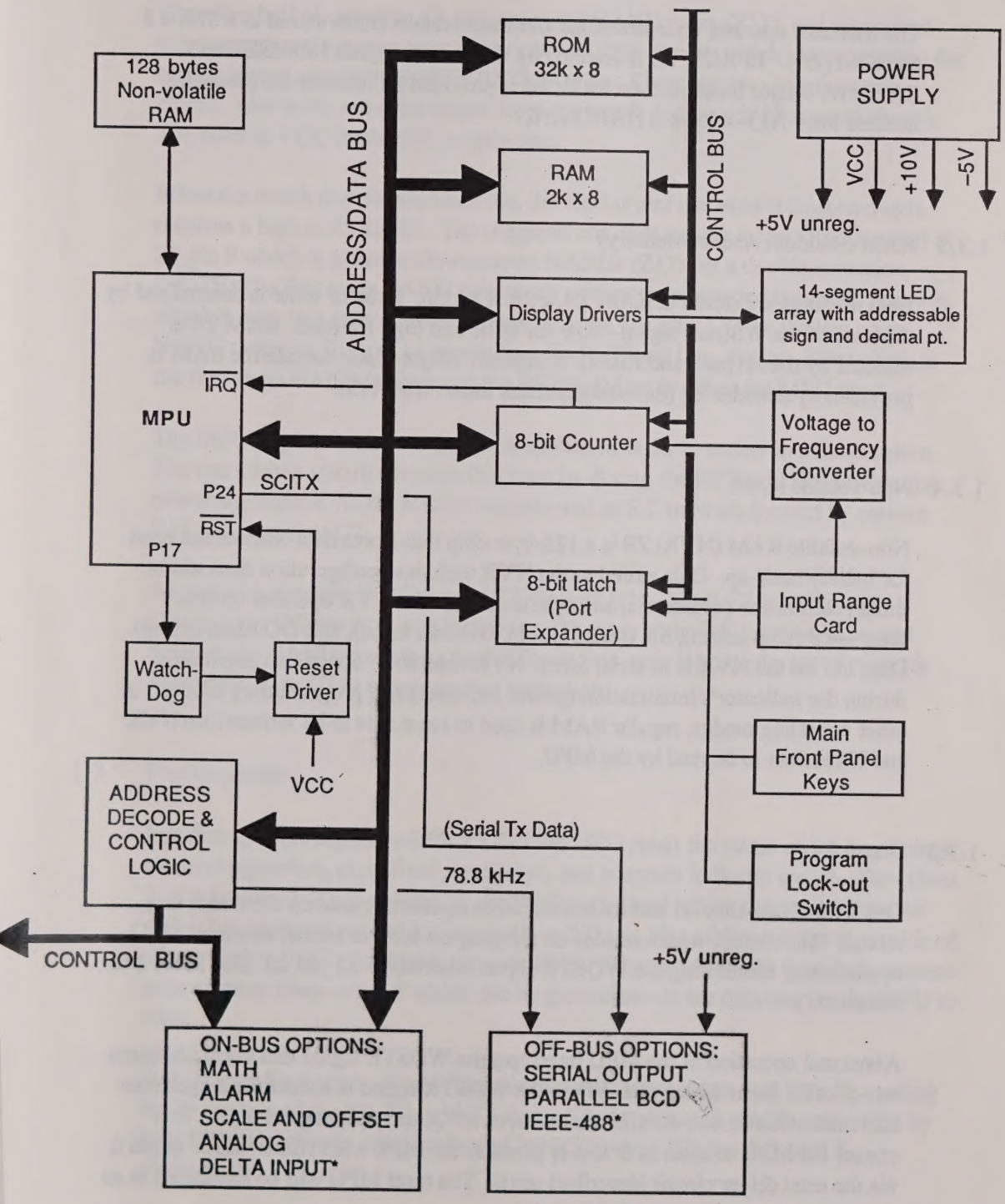
- The input range card is a plug-on board which is used to condition a particular sensor for input to the Voltage to Frequency Converter.

With obvious exception of the input range card, the main board sub-assemblies are not normally removed and/or replaced. A more complete discussion of the circuits just mentioned is given in the following paragraphs.

1.3.1 MPU

MPU Z1 is an 8-bit Motorola 6803 microprocessor. (See sheet 2 of schematic.) This device uses a multiplexed data bus with the lower order address (A0–A7) appearing on the data bus when the address strobe signal at Z1 pin 39 goes high.

The microprocessor is driven by crystal oscillator Y1 at 4.9152 MHz. With this input, the MPU divides the frequency by four to provide the 1.2288 MHz ECLK sync signal at Z1 pin 40. The ECLK signal is used as a clock input and sync signal for various circuits throughout the system.



* Options to be available at a later date.

1.3.2 ROM (Read Only Memory)

The indicator operates on instructions and linearization tables stored in a 32K x 8 EPROM (Z5). EPROM Z5 is selected by the control signals ROMSEL and R(not)/W. Major block decode for ROM is provided by decoder Z6 (decoding address lines A13–A15) via NAND Z16.

1.3.3 RAM (Random Access Memory)

Data readings are stored in RAM Z4, a 2K x 8 chip. Read or write is determined by the state of the WS(not) signal—low for write and high for read. RAM Z4 is selected by the H1(not) and R(not)/W signals. Major block decode for RAM is provided by decoder Z6 (decoding address lines A13–A15).

1.3.4 Non-volatile RAM

Non-volatile RAM (NVR) Z9 is a 128-byte chip that stores data without the need for battery back-up. Data stored in the NVR includes configuration data, alarm limits, calibration parameters, and option status. The NVR operates on four lines—CS (chip select), SK (serial clock), DI (data input), and DO (data output). Data I/O for the NVR is in serial form. NVR read/write operations occur only during the indicator's intialization (power on, reset) and programming modes. In other operating modes, regular RAM is used to store data to be written into NVR and NVR data to be read by the MPU.

1.3.5 Watch Dog

One half of one-shot Z8 and its associated components make up the watch dog circuit. This circuit, which resides on the plug-on brother board, monitors MPU operation by monitoring the WDSTR signal from MPU Z1 pin 20. (See sheet 2 of schematic).

Abnormal operation of the MPU interrupts the WDSTR signal that normally keeps one-shot Z8 from timing out. When the WDSTR signal is absent for longer than 220 milliseconds, one-shot Z8 times out as its Q(not) output goes high. This causes the MPU to reset as a low is given to the MPU's RST(not) input at pin 6 via the reset driver circuit (described next). The reset MPU will be initialized in an attempt to recover from the fault condition.

1.3.6 Reset Driver

The other half of one-shot Z8, two cascaded NAND gates (Z17), and associated components make up the reset driver circuit. This circuit, which also resides on the brother board, drives the MPU's RST(not) line. There are two inputs to this circuit. One is the one-shot output from the watch dog circuit (discussed above). The other is VCC (main +5V supply line).

When the watch dog circuit times out, the reset driver one-shot is triggered as it receives a high at Z8 pin 12. The triggered one-shot creates a low Q(not) output at Z8 pin 9 which is given to the cascaded NANDs (Z17) for a double inversion. (NOTE: The first stage NAND effectively performs an inverted input OR function, which is why it is drawn on the schematic as an OR gate.) With the last stage NAND output at Z17 pin 11 controlling the RST(not) line, the low input given to the first stage NAND is passed to the RST(not) line to effect the MPU reset.

The MPU requires a reset as power is applied in order to ensure synchronization. The reset driver circuit provides this reset by drving the RST(not) line low during power application via the NAND cascade and an RC network formed by resistor R18 and capacitor C7.

As power is applied, VCC charges C7 through R18. Until C7 is sufficiently charged, the RC junction is at logic zero. The low at the RC junction is passed through the NAND cascade to the RST(not) line, which holds the MPU reset for the time it takes C7 to charge up to a logic high.

1.3.7 Port Expander

It is through port expander latch Z3 that the MPU reads the status of the input range card configuration, main front panel keys, and program lock-out switch. (See sheet 3 of schematic.) Z3 is enabled by the PXE(not) signal which originates from the address decode and control logic circuits at Z13 pin 10. All lines at the input side of Z3 are tied to VCC via resistor network RN3. When enabled, Z3 passes the current state of these lines—any of which can be grounded—to the data bus for the MPU to read:

Input Range Card type—the MPU determines the input range card type by reading the logic state of the X0, X1, and X3 lines. The input range card forms the ID by grounding a particular combination of X0-X3 lines at P2 pins 6, 7, and 8 respectively.

Main Front Panel Key status—the MPU detects a pressed key (or keys) by reading the logic state of the lines coming from P6 pins 18, 19, 20, and 22. When a key is pressed, its associated pull-up is grounded to pinpoint the key.

Program Lock-out Switch status—the MPU determines the program lock-out switch status by reading the logic state of the LOCK line. With the switch *on*, the LOCK line is grounded and programming is disabled. With the switch *off*, the LOCK line is pulled high and programming is enabled.

1.3.8 Address Decode and Control Logic

The address decode and control logic decodes the higher order address to produce the major control signals for selecting or enabling various chips. These include, RAM/ROM memory, latches, and driver circuits.

A major part of the address decode and control logic block resides on the plug-on brother board. The remainder of the block resides on each on-bus option card (alarm, math, analog etc.). On the main board, this circuit is made up of decoders Z6 and Z7 and associated gates. (See sheet 2 of schematic.) The on-bus options have a similar circuit.

1.3.9 Main Power Supply

The main power supply consists of power transformer T1, bridge rectifiers CR5 and CR6, voltage regulators Z19, Z24, Z25, and Z29, and associated components. (See sheet 4 of schematic.)

AC input is given through fuse F1 to the primary side of T1 via the balanced RC filter (R47/C15, R48/C14) which is used to suppress line noise. Resistors R47 and R48 also serve as fuses in the event the primary draws excessive current. The T1 primary has two tapped windings. Depending on how they are connected, these windings provide the transformer with various step-down ratios to accommodate a particular AC voltage.

Two separate secondary windings on T1 provide separate power supplies for digital circuits and analog conversion circuits.

Bridge rectifier CR5, regulator Z19 and associated components make up the supply that powers the digital circuits. The output of regulator Z19 provides the VCC line which supplies +5 V to the digital circuits on the main board. The +5 V UNREG

line, which is taken from CR5's rectified output (input to Z19), supplies the input power to the option cards.

Bridge rectifier CR6, regulators Z24, Z25, and Z29, and associated components make up the supply that powers the analog conversion circuits. Regulator Z24 regulates the output of CR6 (about 30 V) to about –15 volts which sets the reference for the other two regulators. The output of Z25 supplies the –5 V line. The output of Z29 supplies the +10 V line. Transistor Q7 gives the +10 V line a boost in current capacity. Filter capacitors C20 and C21 ensure a very low ripple output.

1.3.10 A/D Architecture, General

The A/D (analog-to-digital) scheme used in the indicator is an integrating voltage to frequency type, operating in the range of 100 Hz (with 52 mV input) to 6700 Hz (with 3.5 V input). The actual transfer function is:

$$F_{OUT} = (V_{IN} \times F_{IN}) \div (2 \times V_{REF})$$

Where F_{IN} is the master clock input (38.4 kHz) and V_{REF} is the reference voltage (10 volts). Since the voltage to frequency converter (VFC) always operates in this range, an input range card is required to translate the sensor input voltage (or resistance, current, etc.) to the 53 mV to 3.5 V input range of the VFC. The input range card, therefore, contains all circuitry associated with the particular sensor type being measured, e.g. reference junction and break detect for thermocouples, excitation current for RTDs and thermistors, shunt resistor for current, etc. All input range cards also have input multiplexing which allows the A/D to take a zero reading for digital autozero purposes.

The output of the VFC A/D is a square wave, nominally between 100 Hz and 6700 Hz. Physical frequency limits of the A/D are DC (large negative input voltage) to F_{IN} + 4 (9600 Hz, for large positive input voltages). The square wave is applied to the CPU, which samples the square wave for an integral number of power line cycles (200 msec or 400 msec depending on range) and determines the frequency. This method retains the normal mode noise rejection inherent in a dual slope type conversion.

The resolution for this type of A/D, unlike the dual slope converter, is not a fixed number of "microvolts per count". Instead, the resolution is dependent on the output frequency, which in turn yield high resolution measurements (the CPU can resolve time in increments of .8 µsec). This accommodates thermocouple response

very well since decreasing temperature causes a decrease in thermocouple sensitivity. Resolution as a function of frequency is described by:

Resolution (μV) = Output Frequency (Hz) ÷ [sample time (sec) x CPU freq. (Hz) x overall A/D gain (Hz ÷ μV)]

With an overall gain of .058 Hz/μV and a sample time of 200 msec, at 6700 Hz, the resolution is .47 μV; and at 100 Hz, it is .007 μV. For all practical purposes, resolution is limited by the noise floor of the system.

1.3.11 Sequence of A/D Readings

The pattern of A/D readings occur in sequences of seven conversions—six input readings followed by one status reading. The type of status reading taken depends on the input range card type installed. A thermocouple input range card requires a reference junction reading and a zero channel reading for status. Linear voltage and current input range cards require a zero reading only. RTD and thermistor type input range cards require a zero reading and a calibration reading.

These status readings are part of the housekeeping chores that the luxury of microprocessor based instruments allow. Cold junction compensation is achieved digitally by taking a separate ambient temperature reading on the reference junction channel. Autozero is done digitally by taking a separate reading of the zero level on the zero channel. Calibration is done by software by storing gain and offset adjustment constants in non-volatile memory. The overall result is a more accurate and stable instrument with fewer adjustment controls.

1.3.12 *Voltage to Frequency Converter*

The Voltage to Frequency Converter (VFC) circuit is made up of op-amp Z26, dual flip-flop Z28 and associated components. (See sheet 3 of schematic.) This type of circuit operates in similar fashion to a dual slope converter in that it contains an integrator (Z26 and associated components), threshold detector (cascaded inverters, Z27 input pin 11, output pin 6, resistors R39, 40, and 41), and reference voltage (supplied by Z28 pin 2). But, whereas a dual slope converter integrates the input voltage alone for a period of time then de-integrates using the reference alone until zero crossing, the VFC combines these two phases into a continuous process.

The accompanying timing diagram shows you how the VFC circuit works. The following description is keyed to the timing diagram by number:

The integrator output ramps up as the input voltage (VIN) is applied to its non-inverting input (**1**).

When the integrator output reaches the threshold of the detector circuit (about 5 volts), the output at Z27 pin 6 snaps high due to positive feedback provided by resistor R41 (**2**).

An inverter/buffer (Z27 input pin 9) presents the high detector output as a low to the D input of flip-flop Z28 pin 5. At the same time the low is given to Z28 pin 5, the Q output of flip-flop Z28 pin 13 changes state as the high at Z27 pin 9 clocks the state of the D input through this flip-flop (**3**). The Q output at Z28 pin 13 is the frequency output (FOUT) of the VFC.

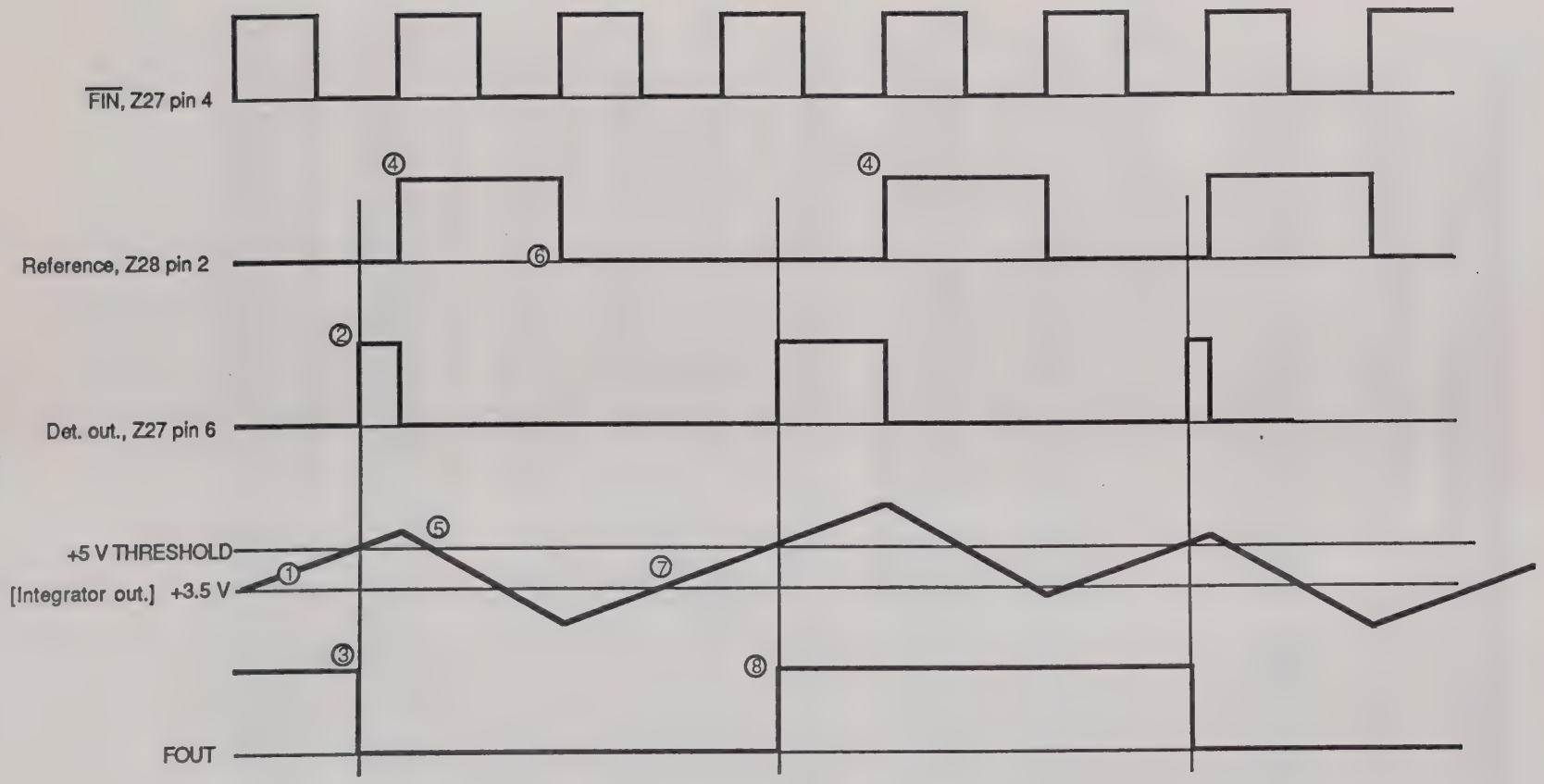
On the rising edge of the clock input at Z28 pin 3 [FIN(not)], the complement of the low D input sitting at Z28 pin 5 is then clocked through to the Q(not) output at Z28 pin 2, providing the 10-volt reference signal (**4**).

The reference signal, given to the inverting input of the integrator at Z26 pin 2 via R42, forces the integrator to ramp down (**5**).

The reference signal is also given to inverter Z27 pin 13. The resultant low output from Z27 pin 12 serves to clamp the detector input low (via diode CR4) during reference application, providing a high to the D input at Z28 pin 5. This high level D input is not clocked through the flip-flop until the next rising edge of the clock, at which time then, the flip-flop's Q(not) output goes low, removing the reference signal from the integrator input (**6**). As you can see from the timing diagram, the reference voltage is always applied to the integrator input for the duration of one FIN clock cycle.

Once the reference voltage is removed, the integrator output is free to ramp up again (**7**). The ramp down period is the same as reference application—one FIN cycle.

When the integrator output reaches threshold, the detector output goes high, at the same time, FOUT changes state (**8**). We have just described how one-half cycle of FOUT is generated. The other half of the FOUT cycle continues as described at (**4**).



TIMING DIAGRAM, VOLTAGE TO FREQUENCY CONVERTER CIRCUIT

The frequency output (FOUT) of the VFC is dependent on the voltage level of VIN. This is apparent in the timing diagram as you note how each ramp up threshold crossing corresponds to a change of state in the FOUT line. In other words, time between threshold crossings, which is dependent on the amplitude of VIN, determines the FOUT frequency. (From a circuit designer's standpoint, the VFC's clock (FIN) frequency and reference voltage level also determines the FOUT frequency. To ensure that only the level of VIN effects a frequency change, the other two frequency determining parameters are tightly controlled—FIN is derived from the crystal frequency, and the reference voltage is produced using double regulation.)

1.3.13 8-bit Counter, Frequency Conversion

The frequency pulse output from the VFC is gated with RST(not) to produce the CNT signal at Z16 pin 12. (See sheet 2 of schematic). Basically, the MPU determines the number of CNT cycles received over a fixed period of time, typically 200 milliseconds. A frequency value is then derived by dividing the sum of CNT cycles by the time period in which it was counted. This frequency, which corresponds directly with the input measured, is translated to the appropriate readout value via the linearization tables stored in ROM.

Rather than count the pulses directly which ties up processor time, the MPU counts the CNT pulses indirectly through the use of counter/latch Z22. We'll discuss how this happpens by describing the events in a 200-msec conversion period (note that a 400-msec conversion time is used on some ranges).

During the first 180 msec, Z22 clocks flip-flop Z12 every time its counter overflows (which means its counter value = 256). Counter overflow generates an MPU IRQ (Interrupt ReQuest) as Z12 transfers the complement of D input to the Q(not) output at pin 8. After overflow, the counter rolls over to zero. CNT is also present at the MPU input pin 8, but it is ignored during the 180-msec period. So, the counter continues to count and overflow (producing an IRQ each time) for the duration of the 180-msec period.

At the end of the 180-msec period, the software activates the input capture mode—Z22 continues to count as before; however, the input at Z1 pin 8 is now active as the MPU's internal registers make note of when each CNT pulse occurs in relation to an internal 16-bit free-running timer. Once 200 milliseconds elapse, the MPU sends two R/W(not) pulses to latch and read Z22's counter value. Also at this time, internal registers store the (1) timer value taken at the start of the final period (the last full cycle before the 200-msec mark), (2) the timer value at the 200-msec mark, and (3) the timer value at the end of the final period after the 200-msec

mark. These three timer counts are used to calculate the fraction of the cycle at the precise instant of the 200-msec mark. The end of the 200-msec period marks the end of the current conversion cycle. Just before the start of the next conversion cycle, the complement of R/W(not) is given to the Z22 pin 10 to reset the counter to zero.

The MPU determines the exact number of CNT cycles in the 200-msec period by adding 256 for every IRQ it received during the 180-msec period, adding Z22's latched count value at the end of the 200 msec period, and adding the fractional part of the cycle at the 200-msec mark. The resulting sum of CNT cycles is then divided by the time period in which it was counted (200 msec) to arrive at a frequency value.

1.3.14 Display Circuits

The display circuits are made up of display driver Z30, and 14-segment dual digit LED readout chips DS1–DS4. (See sheet 5 of schematic.) Also included in this functional block is the sign and decimal point driver circuit made up of 8-bit latch Z15, transistors Q1 and Q2, quad NOR Z20 and dual 4-input NOR Z21. (See sheet 2 of schematic.)

The display readouts DS1–DS4 are controlled by display driver Z30. Z30 reduces the hardware count by using an integral chip in place of discrete components. Z30 also relieves the MPU of the control aspects of the display readout since the display driver provides all multiplexing and segment driving functions.

The display driver operates in the random mode (selected by grounding pin 31) in which the addressed digit is determined by the address appearing on Z30 pins 28-30. Selection of the display driver is provided by decoders Z6 and Z7 which produce H0(not) and J4(not) for Z30's chip select. The selection of Z30 is synced to the rising edge of ECLK.

A particular character is generated by presenting its 6-bit ASCII equivalent on the data bus. The complement of the MPU's R/W(not) line (from Z11 pin 6) latches the character into the device. (In this application, the CS input at pin 14 is used as the read/write control.) The character is then illuminated on one of the 14-segment LED digits as the appropriate display segments are driven high (Z30 *SEG* lines), and the appropriate display cathode is driven low (Z30 *CHAR* lines).

The LED sign indicator and the decimal point on the 14-segment display are addressed independently from the character display. Data lines D0-D4, via latch

Z15, determine the on/off status of sign LED CR15 and the on/off status of the four addressable decimal point positions.

Status for the sign LED is given by the D0 line when latched on the LPD signal by Z15. A latched high or low from this line turns Q1 on or off respectively. When on, Q1 applies VCC to the anode of sign LED CR15, thus lighting the negative sign. With Q1 off, the anode of CR15 receives no voltage to turn on the sign LED—the negative sign is blanked.

In the process mode, the decimal point is addressed independently of the display driver since Z30 cannot drive a character and decimal point at the same time. Information for decimal point drive is given by the D1-D4 lines when latched on the LPD signal by Z15. The information latched from the D1-D4 lines is gated (Z20 and Z21) with the display's cathode select signals, CA1(not)–CA4(not), to drive (via Q2) the DP (decimal point) line. With Q2 on, the decimal point appears on the display whose common cathode is low.

The decimal point segment of the displays are driven by Z30 pin 4 via diode CR14 in the program mode only. Since some programming requires that five decimal places be shown (DS3 being the extra display for DP drive), and since a character and decimal point is made to alternately flash in the program mode, the decimal point addressing of Z30 is used to good advantage. CR14 isolates the output at Z30 pin 4 from the external decimal point drive in the process mode.

1.4 INPUT RANGE CARD, GENERAL

There are five types of input range cards (IRCs). These include thermocouple, linear voltage, RTD, thermistor, and linear current types. All IRCs operate on the same general principle—that is, a voltage derived from the sensor input is scaled, with a DC offset added, in order to fit the input requirements of the voltage-to-frequency converter.

The IRCs use a single stage op-amp to scale the voltage. The effective gain of the op-amp depends on the input sensor type and the range over which it is measured. Thermocouple, linear voltage, and RTD IRCs use an op-amp whose feedback network is addressable for different gains. At the output of the op-amp, a voltage divider taps the V+ line to introduce a fixed positive dc offset. Different offset levels are used depending on the input type.

Also at the output of the IRC's op-amp, after the voltage divider network, is an RC output filter. Two CMOS switches, configured in a time delay/schmitt trigger-like

circuit, reduces settling time of the output filter by shorting out the resistor leg for about 5 msecs.

In addition to reading the input, all IRCs perform a periodic autozero reading which is a form of status reading. Autozero is done by shorting the IRC's op-amp input to ground through a resistor that matches the resistance of the signal input network. The op-amp's inherent DC offset—which varies according to temperature—is read, then subtracted from the subsequent input reading. This scheme avoids measurement errors due to unpredictable offset voltage.

Additional status readings are taken for thermocouple and RTD type IRCs. Thermocouple IRCs take a reference junction reading periodically in order to compensate for the voltage created by the bi-metal junctions formed at the indicator's input terminals. RTD IRCs take a calibration reading periodically from a fixed precision resistor in order to calibrate itself if the current calibration reading does not match the one stored in memory.

Input protection for the IRC's inputs is provided by a diode/transistor clamp circuit that limits the input voltage excursions to 4 volts in either direction. A series fuse breaks open the high line(s) if excess current is drawn by the clamp circuit.

The following lists the IRCs currently available. Circuit features unique to that IRC are also discussed.

Thermocouple Input Range Card

Assembly: 605-4340-xx
Schematic: 605-6340-xx

Upscale or downscale break detect is selectable via a jumper jack on P3. Depending on the P3 jumper jack position, capacitor C6 is charged through R1 to the level of V+ (for upscale) or V– (for downscale). The positive or negative charge on C6 is normally dissipated through the source resistance. However, if a break exists, the charge is instead amplified by Z2, which registers as a positive or negative overload by the indicator.

Linear Voltage Input Range Card

Assembly: 605-4360-xx
Schematic: 605-6360-xx

The linear input range card multiplexes two channels using the MPU's P10 and P11 lines. These lines are used by the linear voltage IRC to address the measurement input mode and autozero input mode select respectively. The linear voltage IRC uses the P12 line to specifiy the selection of VIN and zero input by choosing either the *unattenuated* input and its zero input equivalent (R2 to GND) or the *attenuated* (100:1 divider ratio) input (junction of R3 and R4) and its zero input equivalent (R6 to GND). In addition, the P13 line selects the negative feedback network, thus the gain, of amplifier Z4. The gain and 100:1 divider status for the four basic ranges are tabulated below:

RANGE	GAIN	100:1 DIVIDER
-15 mV to 99.999 mV	30.208	Out of circuit
-150 mV to 999.99 mV	3.0208	Out of circuit
-1.5 V to 9.9999 V	30.208	In circuit
-15 V to 99.999V	3.0208	In circuit

The P13 line selects Z4's gain by configuring Z4's feedback network of R25, R26, and R27. When P13 is brought high, CMOS switch Z5 is turned on at pin 5 to configure the network for the higher gain circuit. When P13 is brought low, Z5 is turned on instead at pin 6 to configure the network for the lower gain circuit.

RTD Input Range Card

Assembly: 605-4330-xx
Schematic: 605-6330-xx

Op-amp Z5 and associated components make up the current source that provides the RTD excitation current. The application of the excitation current is controlled by the MPU's P10 and P11 lines. The P10 and P11 lines control the I2 lead compensation for 3- or 4-wire hookups as required. The P11 line also selects the current level provided by Z5 (1 mA or 200 µA depending on range).

The excitation current is applied to the RTD (R_{IN}) via the I1 and I2 terminals. When the P14 line is brought low, the input (the voltage drop across the RTD) is amplified by op-amp Z8 whose gain network is controlled by the P12 line. When P12 is brought high, CMOS switch Z1 is turned off at pin 12 to configure the network for the higher gain circuit. When P13 is brought low, Z1 is turned on to configure the network for the lower gain circuit. At the output of Z8, a voltage

divider network made up of resistors R25, R28, R35 and R36 provides a constant offset (.10418 V).

By using various combinations of excitation current and gain values, three input ranges are used to accommodate the various RTD types:

1) 36 Hz/Ω, i = 1 mA, Gain = 18.75 — For Cu 10 range

2) 7.2 Hz/Ω, i = 200 μA, Gain = 18.75 — For PT 100, PT 200, and Ni 120 ranges

3) 1.89 Hz/Ω, i = 200 μA, Gain = 4.92 — For PT 1000 range

All RTD ranges use a 200-msec conversion time.

A cal reading is taken when P13 is brought high. When the unit is intially calibrated, R17, R18, and R38 are measured, and the results stored in memory. During normal operation, the range currently in use determines the addressing of Z3 (A and B input) when a cal status reading is taken—the appropriate resistor is measured and compared to its equivalent in memory. If an appreciable difference is detected, the calibration factor is adjusted as necessary to maintain accuracy.

Thermistor Input Range Card

Assembly: 605-4350-xx
Schematic: 605-6350-xx

Current Input Range Card

Assembly: 605-4370-xx
Schematic: 605-6370-xx

1.5 OPTION ASSEMBLIES, GENERAL

The option cards are divided into two categories, (1) On-bus options and (2) off-bus options. On-bus options operate synchronously using the MPU's address/data/control bus for data and timing. On-bus options include the math, alarm, scale and offset, and analog options. Off-bus options operate asynchronously using internal sync signals, and for data I/O, the MPU's serial port. Off-bus options include all communications options (i.e. serial output).

1.5.1 Alarm Option Card

Assembly: 605-4440-xx
Schematic: 605-6440-xx

The alarm option card's EPROM (Z6) contains the alarm program. (See sheet 1 of schematic.) The MPU addresses the EPROM on the rising edge of ECLK with an effective ANDing of the low state of A12 and the low at decoder Z1 pin 13 (Z1 input = 010_2). Positioning the jumper jack for the alarm card #2 address (P2) prevents Z2 pin 3 from going low during EPROM addressing for the alarm option; thus, the alarm option program is provided by alarm board #1 only. Latch Z5 provides the lower order addressing of the EPROM by strobing the data bus on the AS signal. Power for the alarm option card is provided by regulator Z6 which generates the VCC bus from the +5 V unregulated input.

The K1 and K2 relay coils are driven by dual flip-flop Z9 via transistor drivers Q1 and Q2. (See sheet 2 of schematic.) Jumper jacks establish a relay's mode of operation by directing a flip-flop output to the transistor driver. For a normally de-energized relay, the Q output is used. For a normally energized relay, the Q(not) output is used.

On instruction from the MPU, both Z9 flip-flops are clocked by NAND Z8 which transfers the state of Z9's D inputs—the MPU's D0 and D1 lines—to Z9's output. A single clocking of the flip-flops effects an alarm relay trip or a relay reset depending on the state of the D0 and D1 lines at the time of clocking.

NAND Z10 pin 3 controls the reset inputs to Z9. If either of the two inputs to the NAND go low, the flip-flops, and the relays they control, are reset. The MPU reset line, normally high, forms one input to the NAND—the relays reset (initialize) whenever the MPU resets (power on or watchdog trigger). The relay override input, normally high via pull-up resistor R10, forms the other input to the NAND—the relays are forced to reset when the relay override input is grounded.

1.5.2 Scale and Offset Option Card

Assembly: 605-4450-xx
Schematic: 605-6450-xx

The scale and offset option card's EPROM (Z5) contains the scaling and offset program. The MPU addresses the EPROM on the rising edge of ECLK with an effective ANDing of the low state of A12 and the low at decoder Z1 pin 12 (Z1

input = 011_2). Latch Z4 provides the lower order addressing of the EPROM by strobing the data bus on the AS signal. Power for the scale and offset option card is provided by regulator Z6 which generates the VCC bus from the +5 V unregulated input.

1.5.3 Math Option Card

Assembly: 605-4460-xx
Schematic: 605-6460-xx

The math option card's EPROM (Z5) contains the math program. The MPU addresses the EPROM on the rising edge of ECLK with an effective ANDing of the low state of A12 and the low at decoder Z1 pin 11 (Z1 input = 100_2). Latch Z4 provides the lower order addressing of the EPROM by strobing the data bus on the AS signal. Power for the math option card is provided by regulator Z6 which generates the VCC bus from the +5 V unregulated input.

1.5.4 Analog Output Option Cards

0-10 V Analog Output:
Assembly: 605-4470-xx
Schematic: 605-6470-xx
4-20 mA Analog Output:
Assembly: 605-4490-xx
Schematic: 605-6490-xx

The analog output option card's EPROM (Z6) contains the analog output program. The MPU addresses the EPROM on the rising edge of ECLK with an effective ANDing of the high state of A12 and the low at decoder Z1 pin 12 (Z1 input = 011_2). Latch Z4 provides the lower order addressing of the EPROM by strobing the data bus on the AS signal.

Power for the analog output option card's digital circuits is provided by regulator Z20 which generates the +5 V bus from the +5 V unregulated input. The +5 V bus is also given as input to a DC-DC inverter made up of quad Ex-OR Z21, quad NAND Z22, MOSFETS Q3 and Q4, transformer T1, and associated components. MOSFETS Q3 and Q4 alternately switch the +5 V line at a 76.8 kHz rate through one-half of the T1 primary. This induces a voltage in the T1 secondary which provides the isolated analog circuits' supply of a nominal ±14 V (V+ and V–) in relation to the center tap at the T1 secondary (ISO GND).

Chapter 2
Troubleshooting Tips

2.1 TROUBLESHOOTING TIPS

Before attempting to troubleshoot the unit, make sure that any apparent trouble is actually due to a malfunction within the instrument and not due to open or noisy sensors, improper programming, or improper switch setting.

If the problem can be isolated to a particular circuit, perform a visual check on that circuit. Many faults can be found easily by visual means. If a visual check fails to reveal the cause, take the following steps:

a) Review the Theory of Operation in Chapter 1 for the suspected faulty circuit. This will tell you what the circuit is supposed to do and how it should operate.

b) Make sure that the proper voltages are being supplied to all circuits.

c) Analyze the input waveform for proper voltage levels and rise and fall times.

d) Check for abnormal loads on the circuit in question. The schematic will help you in finding what the load should be.

e) Trace the signal path in the circuit with an oscilloscope to verify proper signals and logic levels.

f) Replace faulty components as required.

CAUTION

Your indicator uses electronic components which can be easily damaged by the discharge of static electricity (electrostatic discharge). *To avoid damage to your indicator due to electrostatic discharge, use handling procedures for static sensitive devices whenever your indicator's circuitry is exposed.* These procedures include...

...troubleshooting and repairing the instrument on an anti-static work surface with all test equipment grounded, and...

...transporting and storing circuit board assemblies in anti-static bags or boxes.

Chapter 3
Drawings

Assembly Name	*Drawing No., Assembly*	*Drawing No., Schematic*
Main Board (Panel Mount Version)	605-4300-xx	605-6300-xx
Main Board (Bench Version)	605-4301-xx	605-6300-xx
RTD Input Range Card	605-4330-xx	605-6330-xx
Thermocouple Input Range Card	605-4340-xx	605-6340-xx
Thermistor Input Range Card	605-4350-xx	605-6350-xx
Linear Voltage Input Range Card	605-4360-xx	605-6360-xx
Current Input Range Card	605-4370-xx	605-6370-xx
Alarm Option Card	605-4440-xx	605-6440-xx
Scale and Offset Option Card	605-4450-xx	605-6450-xx
Math Option Card	605-4460-xx	605-6460-xx
0-10 V Analog Output Option Card	605-4470-xx	605-6470-xx
4-20 mA Analog Output Option Card	605-4490-xx	605-6490-xx

8	7	6	5	4	3	2	1

[4] INSTALL FUSE CLIP (PN 971-0800-04), NOTE ORIENTATION OF STOPS (2 PLACES).

[5] WITHIN EACH INSTRUMENT ALL DISPLAY L.E.D.'S MUST HAVE MATCHING INTENSITY CATEGORY LETTERS. THESE LETTERS CAN BE FOUND ON THE SIDE OF THE DISPLAY TO THE RIGHT OF THE MFG'S P/N & DATE CODE.

[16] HOLD CRYSTAL (PN 967-0250-02) TO BOARD USING 24 AWG BARE BUS WIRE.

[17] BREAK TAB OFF AFTER FLOW-SOLDER.

[18] CLIP PIN 6 OF CONNECTOR P7.

[19] FASTEN DISPLAY BD & MAIN BD AFTER THEY ARE INTERLOCKED USING SCREW 6-32 X 1/4 LG (PN 980-632-025) AND SPLITLOCK WASHER #6 (PN 986-200-06). SEE ILLUSTRATION IN NOTE 11.

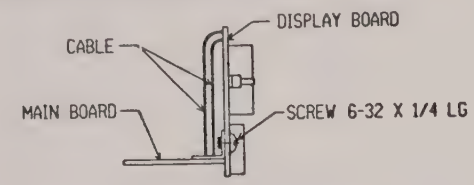
[20] INSTALL IC INTO PIN 3 LOCATION OF Z4. PINS 1,2,27 & 28 NOT USED.

21. FOR MATERIAL LIST, SEE SHEETS 2 THRU 5.

[9] INSTALL TRANSFORMER (PN 967-0050-38) TO BOARD USING SCREW # 4-40 X 1 1/2 LG. (PN 980-4401-50) WITH SCREW HEAD TO BE ON SOLDER SIDE OF BD, AND WASHER FLAT NYLON #4 (PN 986-800-00) (INSTALLED BETWEEN XFMR & PCB), AND SELF-LOCKING FASTENER (PN 991-0201-14).

[10] INSTALL 28 PIN SOCKET (PN 992-010-85).

[11] INSTALL 15 CONDUCTOR CABLE (PN 993-1000-29) AFTER DISPLAY BD AND MAIN BD ARE INTERLOCKED (2 PLACES).



[12] INSTALL WASHER, FLAT, NYLON #4 (PN 986-800-00) BETWEEN HEAD OF SCREW & PCB.

[13] FOR 230V, INSTALL JM5 AND CUT JM6 & JM7.

NOTES: UNLESS OTHERWISE SPECIFIED.

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. RESISTANCE IN OHMS.
3. CAPACITANCE IN MICROFARADS.

[4] RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON SOLDER SIDE.

[5] INSTALL RIGHT ANGLE BRACKET (PN 991-040-57) ON COMPONENT SIDE USING RIVET (PN 991-040-58). RIVET HEAD TO BE ON SOLDER SIDE OF BOARD (2 PLACES).

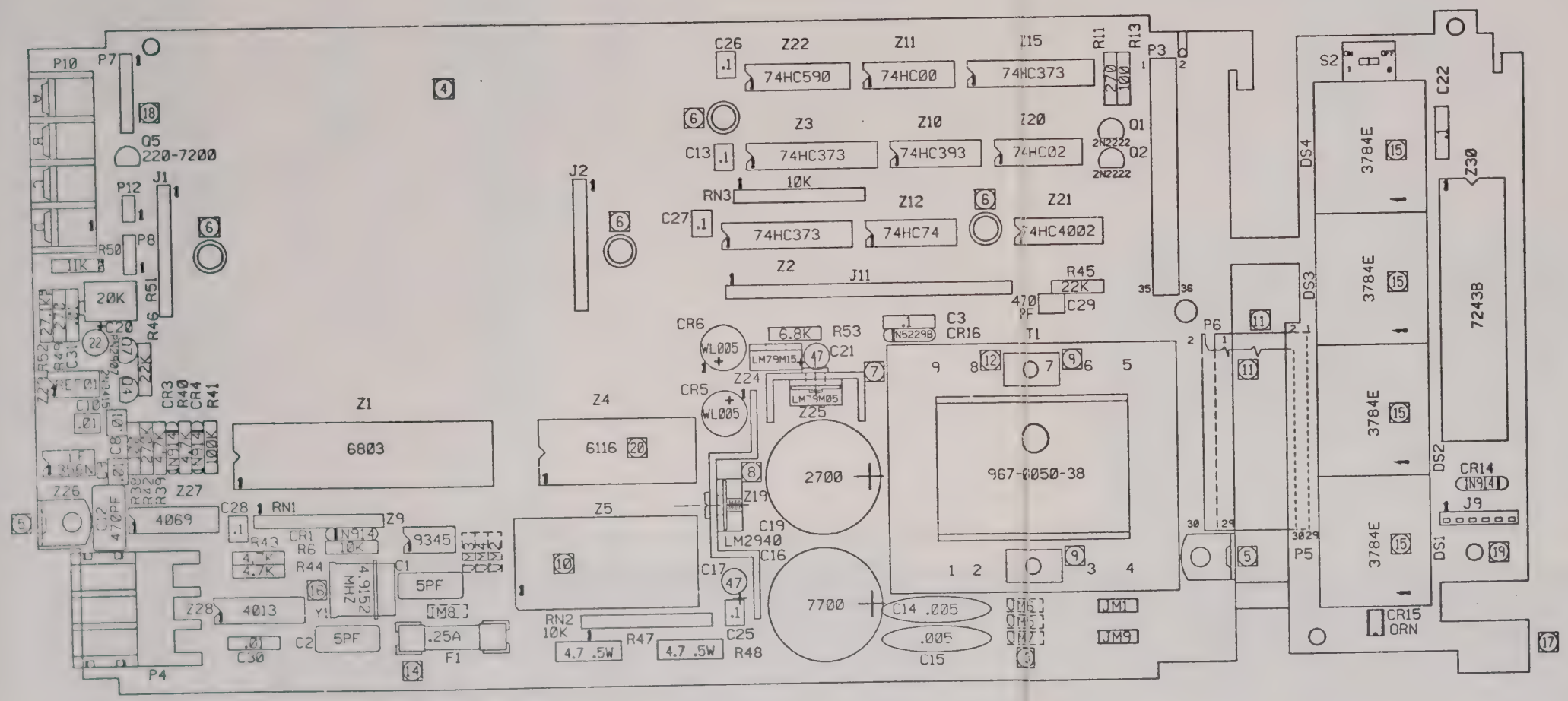
[6] INSTALL STANDOFF 4-40 X .335 LG. (PN 991-0201-15) ON COMPONENT SIDE (4 PLACES).

[7] INSTALL HEAT SINK (PN 991-008-00) USING SCREW #4-40 X 1/4 LG. (PN 980-440-025) AND SELF-LOCKING FASTENER (PN 991-0201-14).

[8] INSTALL HEAT SINK (PN 991-0020-01) USING SCREW # 4-40 X 1/4 LG. (PN 980-440-025) AND SELF-LOCKING FASTENER (PN 991-0201-14). HEAT SINK MUST BE LEVEL AND FULLY SEATED.

REVISIONS

ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X2	R & D RELEASE			
		X3	R & D RELEASE			
		A1	LTD USAGE REL PER E02-11600	DV	8-30-85	J.CRABTREE
		A2	REVISED PER E02-11618	HL	9-17-85	J.CRABTREE
		A3	REVISED PER E02-11638	HL	10-2-85	J.CRABTREE
	00	B	PROD. REL. PER E02-11656	LO	10-15-85	J.CRABTREE
	00	C	REVISED PER E02-11734	HL	12-3-85	J.CRABTREE
	01	B	REVISED PER E02-11736	HL	12-3-85	J.CRABTREE
	01	C	REVISED PER E02-11747	JO	12/4/85	J.Crabtree
	01	D	REVISED PER E02-11758	JO	12/5/85	J.Crabtree
		E	REVISED PER E.O. 2-11802	JO	12/20/85	J.Crabtree
		F	REVISED PER E.O. 2-11805	JO	12/20/85	J.Crabtree



HOLE TOLERANCES	NOTES UNLESS SPECIFIED				
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .X ±.03 DIMENSIONED ANGLES .XX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	S. DUONG	8-05-85	DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO, CA 92123
SUPERSEDES		CHECK	D. VOLLRATH	8-30-85	TITLE: ASSEMBLY, PCB, MAIN BOARD
		APPR.	J. CRABTREE	8-30-85	
		MATERIAL			
USED ON: 600 NEXT ASSY. 605-0000-XX 605-0001-XX		FINISH			SIZE: D; CODE IDENT. NO.; DRAWING NO. 605-4300-01; CHANGE LETTER: F; SCALE 2:1; DO NOT SCALE DRAWING; SHEET 1 OF 5

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8	7	6	5	4	3	2	1

REVISIONS

LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE		5-9-85	
	X2	R & D RELEASE		5-23-85	
	X3	R & D RELEASE		6/17/85	
	A1	LTD USAGE REL PER E.O. 2-11600		8/30/85	
	A2	REVISED PER E.O. 2-11618		9/17/85	
	A3	REVISED PER E.O. 2-11638		12/4/85	
00	B	PRODUCTION RELEASE PER E.O. 2-11656		12/19/85	
	C	REVISED PER E.O. 2-11734		3/13/86	
01	B	REVISED PER E.O. 2-11736		3/13/86	
	C	REVISED PER E.O. 2-11747		4/3/86	
	D	REVISED PER E.O. 2-11758		4/23/86	
	E	REVISED PER E.O. 2-11802		8/26/86	
	F	REVISED PER E.O. 2-11806		9/26/86	

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED

1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°
2. BREAK ALL SHARP EDGES .010 APPROX.
3. MACH. SURFACES √
4. ALL DIM. IN INCHES
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC

DRAWN	S. DUONG	4/25/85
CHECK		5/9/85
APPR.		5/9/85

MATERIAL

DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE:

ASSY, PCB, MAIN BOARD

USED ON 600

FINISH

NEXT ASSY. 605-0000-XX 605-0001-XX

SIZE	DWG NO.	CHANGE LETTER
A	605-4300-01	F

SCALE:

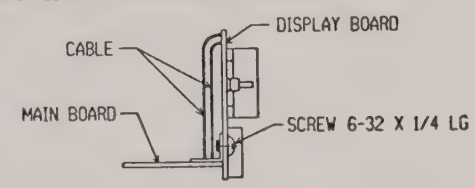
Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	XSTR SELECTED TEMP REF NPN 590MV	220-7200-01	Q5	220-7200-01	
2	1	CAP, CERAMIC 470pf @ 50V	909-0470-01	C29	909-0470-01	
3	1	IC, DIGITAL, DUAL D FLIP-FLOP	4013	Z28	965-587-23	
4	1	IC, DIG, HEX INVERTING BUFFER	4069	Z27	965-587-05	
5	1	IC, MEM, 2K X 8 CMOS STATIC RAM	6116	Z4	965-613-16	
6	1	IC, MICROPROCESSOR 1.25 MHZ	6803-1	Z1	965-5590-06	
7	1	IC DISP CNTRLR 8-CHAR 14/16-SEG ICM7243B	7243B	Z30	965-5590-07	
8	1	IC, DIG, QUAD 2-INPUT NAND	74HC00	Z11	965-6351-00	
9	1	IC, DIG, QUAD 2-INPUT NOR	74HC02	Z20	965-6351-04	
10	3	IC, DIG, OCT D-LATCH TRI-ST OUTPUTS	74HC373	Z15,Z2,Z3	965-6351-02	
11	1	IC, DIG, DUAL 4-BIT BINARY COUNTER	74HC393	Z10	965-6351-17	
12	1	IC, DIG, 2-4IN POS-NOR GATE	74HC4002	Z21	965-6351-31	
13	1	IC, DIG, DUAL D FLIP-FLOP	74HC74	Z12	965-6351-08	
14	1	IC, DIG, 8-BIT BIN CTR 3-ST OUTPUTS	74HC590	Z22	965-6351-33	
15	3	CAP RADIAL .01 @ 50V	900-021-01	C10,C8,C9	900-021-01	
16	5	CAP RADIAL .1 @ 50V	900-021-02	C13,C25,C26,C27,C28	900-021-02	
17	2	CAP AXIAL .1 @ 50V	900-021-08	C3,C22	900-021-08	
18	2	CAP DISC .005 @ 150VRMS	900-021-10	C14,C15	900-021-10	
19	2	CAP MICA RADIAL 5PF @ 500V DM15	915-030-50	C1,C2	915-030-50	
20	1	CAP MICA RADIAL 470PF @ 300V DM15	915-034-71	C12	915-034-71	
21	1	CAP ELECT RADIAL 22 @ 25V	919-0022-01	C20	919-0022-01	
22	2	CAP ELECT RADIAL 47 @ 10V	919-1000-06	C17,C21	919-1000-06	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
23	1	CAP ELECT RADIAL 2700 @ 35V	919-2700-00	C19	919-2700-00	
24	1	CAP ELECT RADIAL 7700 @ 16V	919-7700-00	C16	919-7700-00	
25	1	RES MF RN55C 1.0% 11.0K	924-4110-02	R50	924-4110-02	
26	1	RES MF RN55C 1.0% 27.1K	924-427-12	R52	924-427-12	
27	2	RES, CBN 1/2W 5% 4.7 OHM	942-304-79	R47,R48	942-304-79	
28	2	RES CBN 1/4W 5% 100 OHM	942-201-01	R13,R38	942-201-01	
29	1	RES CBN 1/4W 5% 10K	942-201-03	R6	942-201-03	
30	1	RES CBN 1/4W 5% 100K	942-201-04	R41	942-201-04	
31	2	RES CBN 1/4W 5% 22K	942-202-23	R45,R46	942-202-23	
32	2	RES CBN 1/4W 5% 270 OHM	942-202-71	R11,R49	942-202-71	
33	1	RES CBN 1/4W 5% 270K	942-2027-04	R42	942-2027-04	
34	4	RES CBN 1/4W 5% 4.7K	942-204-72	R39,R40,R43,R44	942-204-72	
35	3	RES NETWK 10K SIP 9RES	952-010-02	RN1,RN2,RN3	952-010-02	
36	1	POT, 20K CERMET M-TURN END ADJ	960-0120-21	R51	960-0120-21	
37	4	DIODE 1N914 (1N4148)	961-091-40	CR1,CR14,CR3,CR4	961-091-40	
38	1	RES CBN 1/4W 5% 6.8K	942-206-82	R53	942-206-82	
39	2	XSTR 2N2222	962-222-20	Q1,Q2	962-222-20	
40	1	XSTR 2N3415 NPN	962-341-50	Q4	962-341-50	
41	1	XSTR PN2907 PNP	962-290-70	Q7	962-290-70	
42	1	REGULATOR POS 5V LM2940	964-5300-04	Z19	964-5300-04	
43	1	REGULATOR NEG 5V LM79M05	965-5510-09	Z25	965-5510-09	
44	1	REGULATOR NEG 15V LM79M15	965-5510-10	Z24	965-5510-10	
45	1	IC LF356N OPAMP 8 PIN DIP	965-616-00	Z26	965-616-00	
46	1	IC REFERENCE PREC 10V 8 PIN DIP REF01	965-6360-06	Z29	965-6360-06	
47	2	RECT BRIDGE 1A 50V WL005	966-002-26	CR5,CR6	966-002-26	

Item No.	Qty Reqd	Description / Identification		Reference Designation	Part Number	See Note
48	1	XFMR POWER DUAL PRI DUAL SEC	967-0050-38	T1	967-0050-38	
49	1	XTAL 4.9152MHZ HC-18	967-0250-02	Y1	967-0250-02	
50	1	LED ORANGE RECT BAR 3297A	968-0100-24	CR15	968-0100-24	
51	4	DISPLAY ORANGE DUAL 14-SEGMENT 3784E	968-0100-25	DS1,DS2,DS3,DS4	968-0100-25	
52						
53	1	SWITCH DIP 1PST LO-PROFILE	969-0500-21	S2	969-0500-21	
54	1	CONN 3 PIN HEADER .1 L.S.	973-0101-30	P8	973-0101-30	
55	1	CONN POWER 3 PIN HEADER	973-0101-59	P4	973-0101-59	
56	1	CONN SOCKET 22 POS	973-0101-69	J11	973-0101-69	
57	1	TERMINAL BLOCK 4 POS RT ANGLE	973-0101-65	P10	973-0101-65	
58	1	CONN RECPTL 6 POS LO-PROFILE	973-0700-96	J9	973-0700-96	
59	2	CONN SOCKET 10 POS	973-0101-68	J1,J2	973-0101-68	
60	1	CONN 6 PIN HEADER .1 L.S.	973-3700-19	P7	973-3700-19	
61	1	CONN 2 PIN HEADER .1 L.S.	973-3700-23	P12	973-3700-23	
62	1	CONN 36-PIN HEADER DUAL ROW	973-3700-31	P3	973-3700-31	
63	2	JUMPER .5" 22AWG	991-010-05	JM1,JM9	991-010-05	
64	1	IC, MEMORY 1024-BIT EEPROM	NMC9345	Z9	965-6100-23	
65	1	PCB, MAIN BOARD	605-2300-02		605-2300-02	
66	1	SCHEMATIC, MAIN BOARD	605-6300-02		605-6300-02	
67	3	WASHER, FLAT, NYL #4	986-800-00		986-800-00	
68	2	CABLE, 15 COND. 2.0" LG	993-1000-29	P5,P6	993-1000-29	
69	4	STAND-OFF, #4-40 X .335 " LG	991-0201-15		991-0201-15	
70	2	BRACKET, MTG, RIGHT ANGLE	991-040-57		991-040-57	
71	2	RIVET	991-040-58		991-040-58	
72	1	ASSY, PCB, BROTHER BOARD	605-4390-01	INSTALLED AT TESTED LEVEL	605-4390-01	
73	1	HEAT SINK	991-0020-01		991-0020-01	
74	1	HEAT SINK	991-008-00		991-008-00	
75	1	SOCKET 28 PIN	992-010-85		992-010-85	
76	2	SCREW, PAN HEAD PHILLIPS #4-40 X 1½ LG	980-4401-50		980-4401-50	
77	4	FASTENER, TINNERMAN SELF LOCKING	991-0201-14		991-0201-14	
78	2	SCREW, PAN HEAD PHILLIPS #4-40 X 1/4 LG	980-440-025		980-440-025	
79	1	DIODE, 1N5229B	961-522-92	CR16	961-522-92	
80	2	CAP, AXIAL .01 @50V	900-021-07	C30,C31	900-021-07	
81	1	FUSE .25A	971-0700-25	F1	971-0700-25	
82	2	FUSECLIP 2 PIN	971-0800-04		971-0800-04	
83	1	SCREW, PAN HD PHILLIPS, 6-32 X 1/4 LG	980-632-025		980-632-025	
84	1	WASHER, SPLITLOCK NO. 6	986-200-06		986-200-06	

15. WITHIN EACH INSTRUMENT ALL DISPLAY L.E.D.'S MUST HAVE MATCHING INTENSITY CATEGORY LETTERS. THESE LETTERS CAN BE FOUND ON THE SIDE OF THE DISPLAY TO THE RIGHT OF THE MFG'S P/N & DATE CODE.
16. HOLD CRYSTAL (PN 967-0250-02) TO BOARD USING 24 AWG BARE BUS WIRE.
17. INSTALL STRAIN RELIEF BRACKET (PN 605-2580-00) ON COMPONENT SIDE USING RIVET (PN 991-0400-82). RIVET HEAD TO BE ON SOLDER SIDE OF BOARD.
18. INSTALL DISS-O-PAD (PN 979-0200-16) AT END PINS OF DISPLAY (4 PLACES ON EACH DISPLAY).
19. INSTALL WHITE BUTTON (PN 969-0111-00) ONTO SWITCH SHAFT (PN 969-010-11) AFTER DISPLAY BD & MAIN BD ARE INTERLOCKED.
20. BREAK TAB OFF AFTER FLOW-SOLDER.
21. CLIP PIN 6 OF CONNECTOR P7.
22. FASTEN DISPLAY BD & MAIN BD AFTER THEY ARE INTERLOCKED USING SCREW 6-32 X 1/4 LG (PN 980-632-025) AND SPLITLOCK WASHER #6 (PN 986-200-06). SEE ILLUSTRATION IN NOTE 11.
23. INSTALL IC INTO PIN 3 LOCATION OF Z4. PINS 1,2,27 & 28 NOT USED.
24. FOR MATERIAL LIST, SEE SHEETS 2 THRU 5.

9. INSTALL TRANSFORMER (PN 967-0050-38) TO BOARD USING SCREW # 4-40 X 1 1/2 LG. (PN 980-4401-50) WITH SCREW HEAD TO BE ON SOLDER SIDE OF BD, AND WASHER FLAT NYLON #4 (PN 986-800-00) (INSTALLED BETWEEN XFMR & PCB), AND SELF-LOCKING FASTENER (PN 991-0201-14).
10. INSTALL 28 PIN SOCKET (PN 992-010-85).
11. INSTALL 15 CONDUCTOR CABLE (PN 993-1000-29) AFTER DISPLAY BD AND MAIN BD ARE INTERLOCKED (2 PLACES).

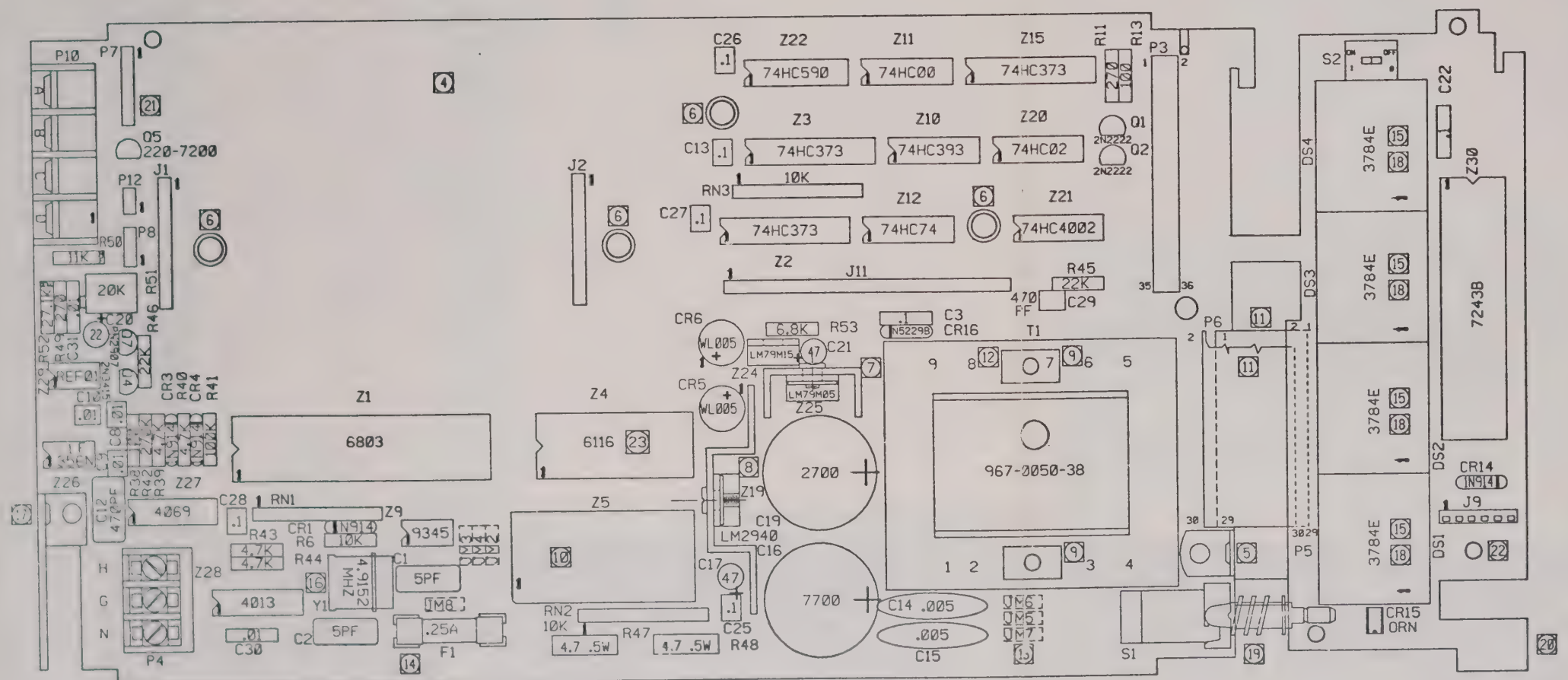


12. INSTALL WASHER, FLAT, NYLON #4 (PN 986-800-00) BETWEEN HEAD OF SCREW & PCB.
13. FOR 230V, INSTALL JM5 AND CUT JM6 & JM7.
14. INSTALL FUSE CLIP (PN 971-0800-04), NOTE ORIENTATION OF STOPS (2 PLACES).

NOTES: UNLESS OTHERWISE SPECIFIED.

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. RESISTANCE IN OHMS.
3. CAPACITANCE IN MICROFARADS.
4. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON SOLDER SIDE.
5. INSTALL RIGHT ANGLE BRACKET (PN 991-040-57) ON COMPONENT SIDE USING RIVET (PN 991-040-58). RIVET HEAD TO BE ON SOLDER SIDE OF BOARD.
6. INSTALL STANDOFF 4-40 X .335 LG. (PN 971-J201-15) ON COMPONENT SIDE (4 PLACES).
7. INSTALL HEAT SINK (PN 991-008-00) USING SCREW #4-40 X 1/4 LG. (PN 980-440-025) AND SELF-LOCKING FASTENER (PN 991-0201-14).
8. INSTALL HEAT SINK (PN 991-0020-01) USING SCREW # 4-40 X 1/4 LG. (PN 980-440-025) AND SELF-LOCKING FASTENER (PN 991-0201-14). HEAT SINK MUST BE LEVEL AND FULLY SEATED.

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X2	R & D RELEASE	—	—	—
		X3	R & D RELEASE	—	—	—
		A1	LTD USAGE REL PER EO2-11620	BS	10/2/85	J.CRABTREE
		A2	REVISED PER EO2-11618	HL	10/17/85	J.CRABTREE
		A3	REVISED PER EO2-11638	HL	12/24/85	J.CRABTREE
		A4	REVISED PER EO2-11663	HL	12/24/85	J.CRABTREE
	00	B	PROD. REL. PER EO2-11656	LO	12/19/85	J.CRABTREE
	00	C	REVISED PER EO2-11734	HL	12/19/85	J.CRABTREE
	01	B	REVISED PER EO2-11736	HL	12/19/85	J.CRABTREE
	01	C	REVISED PER EO2-11747	[illegible]	[illegible]	[illegible]
	01	D	REVISED PER EO2-11758	[illegible]	[illegible]	[illegible]
		E	REVISED PER E.O. 2-11802	[illegible]	[illegible]	[illegible]
		F	REVISED PER E.O. 2-11806	[illegible]	[illegible]	[illegible]



HOLE TOLERANCES	NOTES UNLESS SPECIFIED				
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.02 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	S. DUONG	9-05-85	DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO, CA 92123
		CHECK	B. SINGFSKY	9-05-85	
		APPR.	J. CRABTREE	9-05-85	
SUPERSEDES		MATERIAL			TITLE: ASSEMBLY, PCB, MAIN BOARD
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION WHICH SHALL NOT BE REPRODUCED OR TRANSFERRED TO OTHER DOCUMENTS OR DISCLOSED TO OTHERS OR USED FOR MANUFACTURING OR ANY OTHER PURPOSE WITHOUT PRIOR WRITTEN PERMISSION OF DORIC SCIENTIFIC.	USED ON 700 NEXT ASSY. 605-0002-XX	FINISH			SIZE D · CODE IDENT. NO. · DRAWING NO. 605-4301-01 · CHANGE LETTER F SCALE 2:1 · DO NOT SCALE DRAWING · SHEET 1 OF 5

REVISIONS

LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE			
	X2	R & D RELEASE		5-28-85	
	X3	R & D RELEASE		6/12/85	
	A1	LTD USAGE REL PER E.O. 2-11600		7/30/85	
	A2	REVISED PER E.O. 2-11618		9/17/85	
	A3	REVISED PER E.O. 2-11638		12/4/85	
	A4	REVISED PER E.O. 2-11663		12/9/85	
00	B	PRODUCTION RELEASE PER E.O. 2-11656		12/19/85	
	C	REVISED PER E.O. 2-11734		3/13/86	
01	B	REVISED PER E.O. 2-11736		3/13/86	
	C	REVISED PER E.O. 2-11747		4/8/86	
	D	REVISED PER E.O. 2-11758		4/25/86	
	E	REVISED PER E.O. 2-11802		8/26/86	
	F	REVISED PER E.O. 2-11806		8/26/86	

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED	DRAWN	S. Duong	5/17/85
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°	CHECK		5-28-85
2. BREAK ALL SHARP EDGES .010 APPROX.	APPR.		6/6/85
3. MACH. SURFACES √	MATERIAL		
4. ALL DIM. IN INCHES			
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

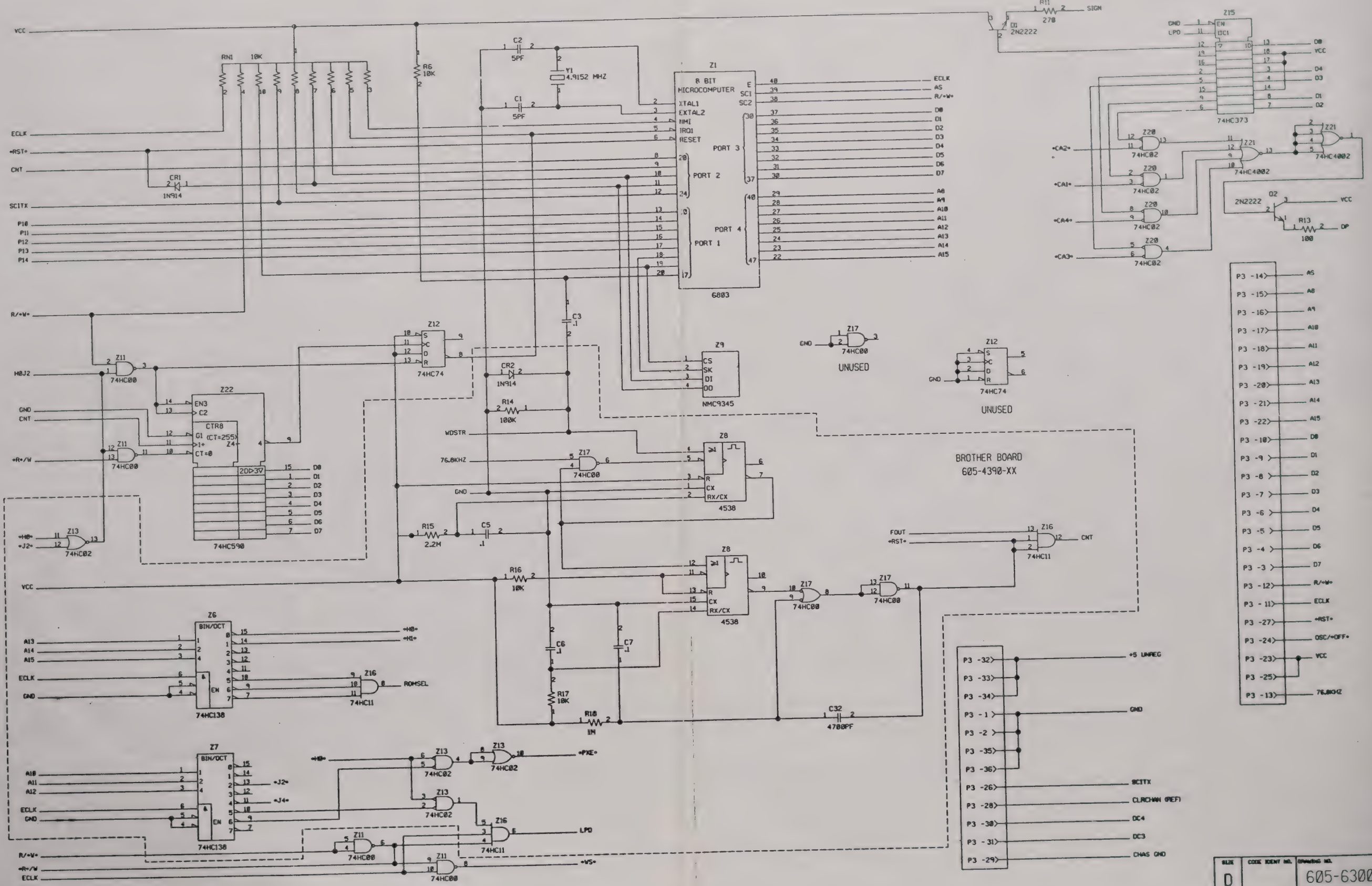
TITLE: ASSY, PCB, MAIN BOARD

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
700		A	605-4301-01	F
NEXT ASSY. 605-0002-XX		SCALE:		SHEET 2 OF 5

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	XSTR SELECTED TEMP REF NPN	220-7200-01	Q5	220-7200-01	
2	1	CAP, CERAMIC 470pf @ 50V	909-0470-01	C29	909-0470-01	
3	1	IC, DIGITAL, DUAL D FLIP-FLOP	4013	Z28	965-587-23	
4	1	IC, DIG, HEX INVERTING BUFFER	4069	Z27	965-587-05	
5	1	IC, MEM, 2K X 8 CMOS STATIC RAM	6116	Z4	965-613-16	
6	1	IC, MICROPROCESSOR 1.25 MHZ	6803-1	Z1	965-5590-06	
7	1	IC, DISP CNTRLR 8-CHAR 14/16-SEG	7243B	Z30	965-5590-07	
8	1	IC, DIG, QUAD 2-INPUT NAND	74HC00	Z11	965-6351-00	
9	1	IC, DIG, QUAD 2-INPUT NOR	74HC02	Z20	965-6351-04	
10	3	IC, DIG, OCT D-LATCH TRI-ST OUTPUTS	74HC373	Z15,Z2,Z3	965-6351-02	
11	1	IC, DIG, DUAL 4-BIT BINARY COUNTER	74HC393	Z10	965-6351-17	
12	1	IC, DIG, 2-4IN POS-NOR GATE	74HC4002	Z21	965-6351-31	
13	1	IC, DIG, DUAL D FLIP-FLOP	74HC74	Z12	965-6351-08	
14	1	IC, DIG, 8-BIT BIN CTR 3-ST OUTPUTS	74HC590	Z22	965-6351-33	
15	3	CAP RADIAL .01 @ 50V	900-021-01	C10,C8,C9	900-021-01	
16	5	CAP RADIAL .1 @ 50V	900-021-02	C13,C25,C26,C27,C28	900-021-02	
17	2	CAP AXIAL .1 @ 50V	900-021-08	C3,C22	900-021-08	
18	2	CAP DISC .005 @ 150VRMS	900-021-10	C14,C15	900-021-10	
19	2	CAP MICA RADIAL 5PF @ 500V DM15	915-030-50	C1,C2	915-030-50	
20	1	CAP MICA RADIAL 470PF @ 300V DM15	915-034-71	C12	915-034-71	
21	1	CAP ELECT RADIAL 22 @ 25V	919-0022-01	C20	919-0022-01	
22	2	CAP ELECT RADIAL 47 @ 10V	919-1000-06	C17,C21	919-1000-06	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
23	1	CAP ELECT RADIAL 2700 @ 35V	919-2700-00	C19	919-2700-00	
24	1	CAP ELECT RADIAL 7700 @ 16V	919-7700-00	C16	919-7700-00	
25	1	RES MF RN55C 1.0% 11.0K	924-4110-02	R50	924-4110-02	
26	1	RES MF RN55C 1.0% 27.1K	924-427-12	R52	924-427-12	
27	2	RES, CBN 1/2W 5% 4.7 OHM	942-304-79	R47,R48	942-304-79	
28	2	RES CBN 1/4W 5% 100 OHM	942-201-01	R13,R38	942-201-01	
29	1	RES CBN 1/4W 5% 10K	942-201-03	R6	942-201-03	
30	1	RES CBN 1/4W 5% 100K	942-201-04	R41	942-201-04	
31	2	RES CBN 1/4W 5% 22K	942-202-23	R45,R46	942-202-23	
32	2	RES CBN 1/4W 5% 270 OHM	942-202-71	R11,R49	942-202-71	
33	1	RES CBN 1/4W 5% 270K	942-2027-04	R42	942-2027-04	
34	4	RES CBN 1/4W 5% 4.7K	942-204-72	R39,R40,R43,R44	942-204-72	
35	3	RES NETWK 10K SIP 9RES	952-010-02	RN1,RN2,RN3	952-010-02	
36	1	POT, 20K CERMET M-TURN END ADJ	960-0120-21	R51	960-0120-21	
37	4	DIODE 1N914 (1N4148)	961-091-40	CR1,CR14,CR3,CR4	961-091-40	
38	1	RES CBN 1/4W 5% 6.8K	942-206-82	R53	942-206-82	
39	2	XSTR PN2222	962-222-20	Q1,Q2	962-222-20	
40	1	XSTR 2N3415 NPN	962-341-50	Q4	962-341-50	
41	1	XSTR PN2907 PNP	962-290-70	Q7	962-290-70	
42	1	REGULATOR POS 5V LM2940	964-5300-04	Z19	964-5300-04	
43	1	REGULATOR NEG 5V LM79M05	965-5510-09	Z25	965-5510-09	
44	1	REGULATOR NEG 15V LM79M15	965-5510-10	Z24	965-5510-10	
45	1	IC LF356N OPAMP 8 PIN DIP	965-616-00	Z26	965-616-00	
46	1	IC REFERENCE PREC 10V 8 PIN DIP	965-6360-06	Z29	965-6360-06	
47	2	RECT BRIDGE 1A 50V	966-002-26	CR5,CR6	966-002-26	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
48	1	XFMR POWER DUAL PRI DUAL SEC	967-0050-38	T1	967-0050-38	
49	1	XTAL 4.9152MHZ HC-18	967-0250-02	Y1	967-0250-02	
50	1	LED ORANGE RECT BAR	968-0100-24	CR15	968-0100-24	
51	4	DISPLAY ORANGE DUAL 14-SEGMENT	968-0100-25	DS1,DS2,DS3,DS4	968-0100-25	
52	1	SWITCH 2P2T PUSH-BUTTON LATCHING	969-010-11	S1	969-010-11	
53	1	SWITCH DIP 1PST LO-PROFILE	969-0500-21	S2	969-0500-21	
54	1	CONN 3 PIN HEADER .1 L.S.	973-0101-30	P8	973-0101-30	
55	1	TERMINAL BLOCK, 3 POS VERTICAL	973-0101-50	P4	973-0101-50	
56	1	CONN SOCKET 22 POS	973-0101-69	J11	973-0101-69	
57	1	TERMINAL BLOCK 4 POS RT ANGLE	973-0101-65	P10	973-0101-65	
58	1	CONN RECPTL 6 POS LO-PROFILE	973-0700-96	J9	973-0700-96	
59	2	CONN SOCKET 10 POS	973-0101-68	J1,J2	973-0101-68	
60	1	CONN 6 PIN HEADER .1 L.S.	973-3700-19	P7	973-3700-19	
61	1	CONN 2 PIN HEADER .1 L.S.	973-3700-23	P12	973-3700-23	
62	1	CONN 36-PIN HEADER DUAL ROW	973-3700-31	P3	973-3700-31	
63	1	SCREW, PAN HD PHILLIPS, 6-32 X 1/4 LG	980-632-025		980-632-025	
64	1	IC, MEMORY 1024-BIT EEPROM	NMC9345	Z9	965-6100-23	
65	1	PCB, MAIN BOARD	605-2300-02		605-2300-02	
66	1	SCHEMATIC, MAIN BOARD	605-6300-02		605-6300-02	
67	3	WASHER, FLAT, NYL #4	986-800-00		986-800-00	
68	2	CABLE, 15 COND. 2.0" LG	993-1000-29	P5,P6	993-1000-29	
69	4	STAND-OFF, #4-40 X .335" LG	991-0201-15		991-0201-15	
70	1	BRACKET, MTG, RIGHT ANGLE	991-040-57		991-040-57	
71	1	RIVET	991-040-58		991-040-58	
72	1	ASSY, PCB, BROTHER BOARD	605-4390-01	INSTALLED AT TESTED LEVEL	605-4390-01	
73	1	HEAT SINK	991-0020-01		991-0020-01	
74	1	HEAT SINK	991-008-00		991-008-00	
75	1	SOCKET 28 PIN	992-010-85		992-010-85	
76	2	SCREW, PAN HEAD PHILLIPS #4-40 X 1¼ LG	980-4401-50		980-4401-50	
77	4	FASTENER, TINNERMAN SELF LOCKING	991-0201-14		991-0201-14	
78	2	SCREW, PAN HEAD PHILLIPS #4-40 X ¼ LG	980-440-025		980-440-025	
79	1	DIODE, 1N5229B	961-522-92	CR16	961-522-92	
80	2	CAP, AXIAL .01 @50V	900-021-07	C30,C31	900-021-07	
81	1	WASHER, SPLITLOCK NO. 6	986-200-06		986-200-06	
82	1	BRACKET, STRAIN RELIEF	605-2580-00		605-2580-00	
83	16	DISS-O-PAD TO-16-10	979-0200-16	(DS1-DS4)	979 -0200-16	
84	1	BUTTON, WHITE	969-0111-00	(S1)	969-0111-00	
85	1	RIVET	991-0400-82		991-0400-82	
86	1	FUSE .25A	971-0700-25	F1	971-0700-25	
87	2	FUSECLIP 2 PIN	971-0800-04		971-0800-04	



SIZE	CODE IDENT NO.	DRAWING NO.
D		605-6300-02
SCALE —	DO NOT SCALE DRAWING	SHEET 1

8	7	6	5	4	3	2	1

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X4	R & D RELEASE	—	—	—
		A1	LTD USAGE REL PER E02-11620	D.V.	5/20/85	J. CRABTREE
		A2	REVISED PER E02-11623	H.L.	5/24/85	J. CRABTREE
		A3	REVISED PER E02-11638	H.L.	12/26/85	J. CRABTREE
		B	PROD. REL. PER E02-11656	B.S.	12/17/85	J. CRABTREE
	01	B	REVISED PER E02-11736	H.L.	3/13/86	J. CRABTREE
	01	C	REVISED PER E02-11747	JD	3/14/86	J. CRABTREE
	01	D	REVISED PER E02-11758	JD	3/26/86	J. CRABTREE
	02	B	REVISED PER E.O. 2-11806	JD	7/21/86	J. CRABTREE

NOTES: UNLESS OTHERWISE SPECIFIED.

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5% .

2. CAPACITOR VALUES ARE IN MICROFARADS.

REFERENCE DESIGNATORS		
REF DESIG	LAST USED	NOT USED
IC	Z30	Z5,Z14,Z18,Z23
RESISTOR	R53	R1-R5,R7-R10,R12,R19-R37
CAPACITOR	C32	C4,C11,C18
DIODE	CR16	CR7-CR13
TRANSISTOR	Q7	Q3,Q6
XFMR	T1	
CRYSTAL	Y1	
DISPLAY	DS4	
SWITCH	S2	
CONNECTOR	P12	P1,P2,P9
CONNECTOR	J11	J3-J8,J10
RES NET	RN3	
FUSE	F1	
JUMPER	JM9	

I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	6803	21	VCC	1	GND
		7	VCC		
Z2	74HC373	20	VCC	10	GND
Z3	74HC373	20	VCC	10	GND
Z4	6116	28	VCC	14	GND
Z5	27256	28	VCC	14	GND
		1	VCC		
Z6	74HC138	16	VCC	8	GND
Z7	74HC138	16	VCC	8	GND
Z8	4538	16	VCC	8	GND
Z9	NMC9345	8	VCC	5	GND
Z10	74HC393	14	VCC	7	GND
Z11	74HC00	14	VCC	7	GND
Z12	74HC74	14	VCC	7	GND
Z13	74HC02	14	VCC	7	GND
Z15	74HC373	20	VCC	10	GND
Z16	74HC11	14	VCC	7	GND
Z17	74HC00	14	VCC	7	GND
Z19	LM2940	SEE SCHEMATIC			
Z20	74HC02	14	VCC	7	GND
Z21	74HC4002	14	VCC	7	GND
Z22	74HC590	16	VCC	8	GND
Z24	79M15	SEE SCHEMATIC			
Z25	79M05	SEE SCHEMATIC			
Z26	LF356	SEE SCHEMATIC			
Z27	4069	14	+10V	7	ANAGND
Z28	4013	14	+10V	7	ANAGND
Z29	REF01CP	SEE SCHEMATIC			
Z30	7243B	1	VCC	22	GND

ASSY.NO. 605-4300-XX	SUPERSEDES ——		
	DRAWN	S. DUONG	1-28-85
	CHECK	B. SINOFSKY	8-30-85
	DES/ENG	B. SINOFSKY	8-30-85
	APPR.	J. CRABTREE	8-30-85

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DORIC — DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO,CA 92123

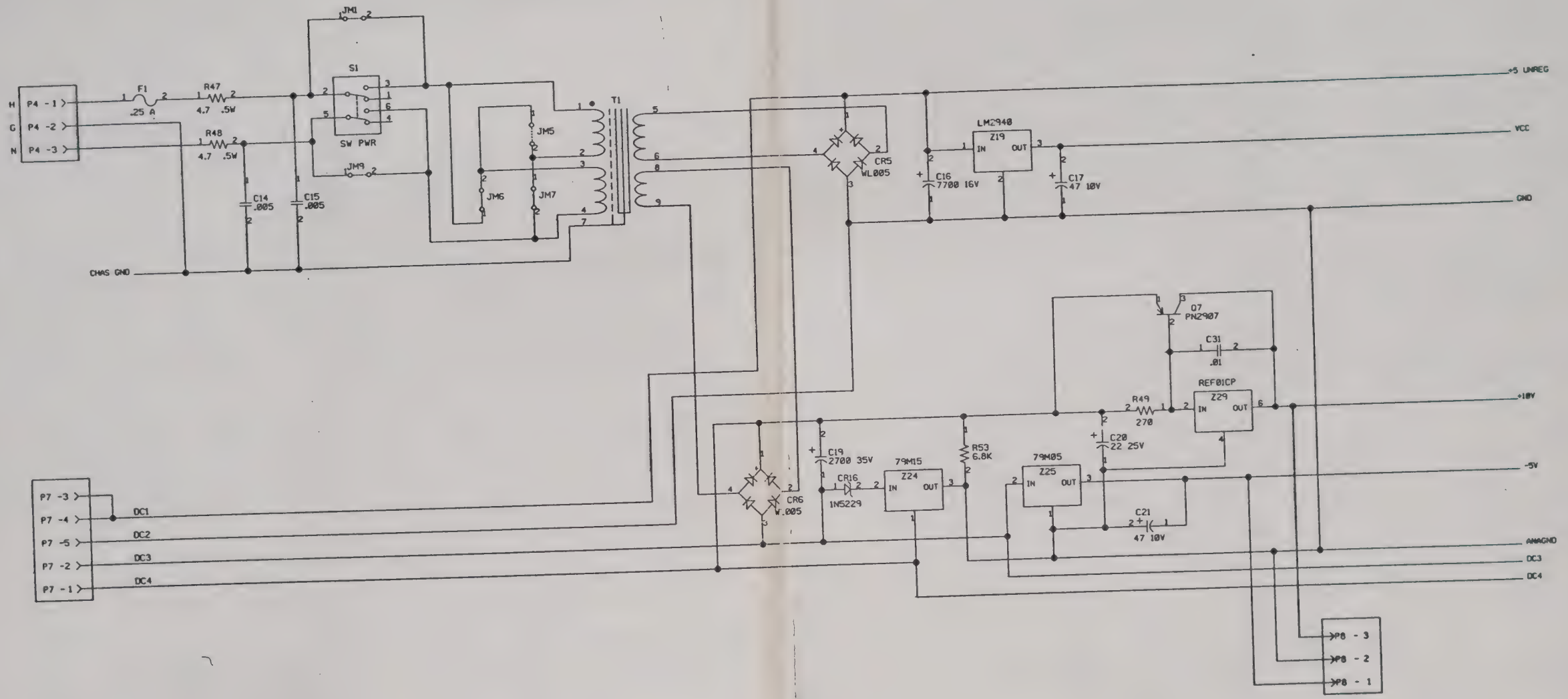
TITLE: SCHEMATIC, MAIN BOARD

SIZE	DRAWING NO.	CHANGE LETTER
D	605-6300-02	B

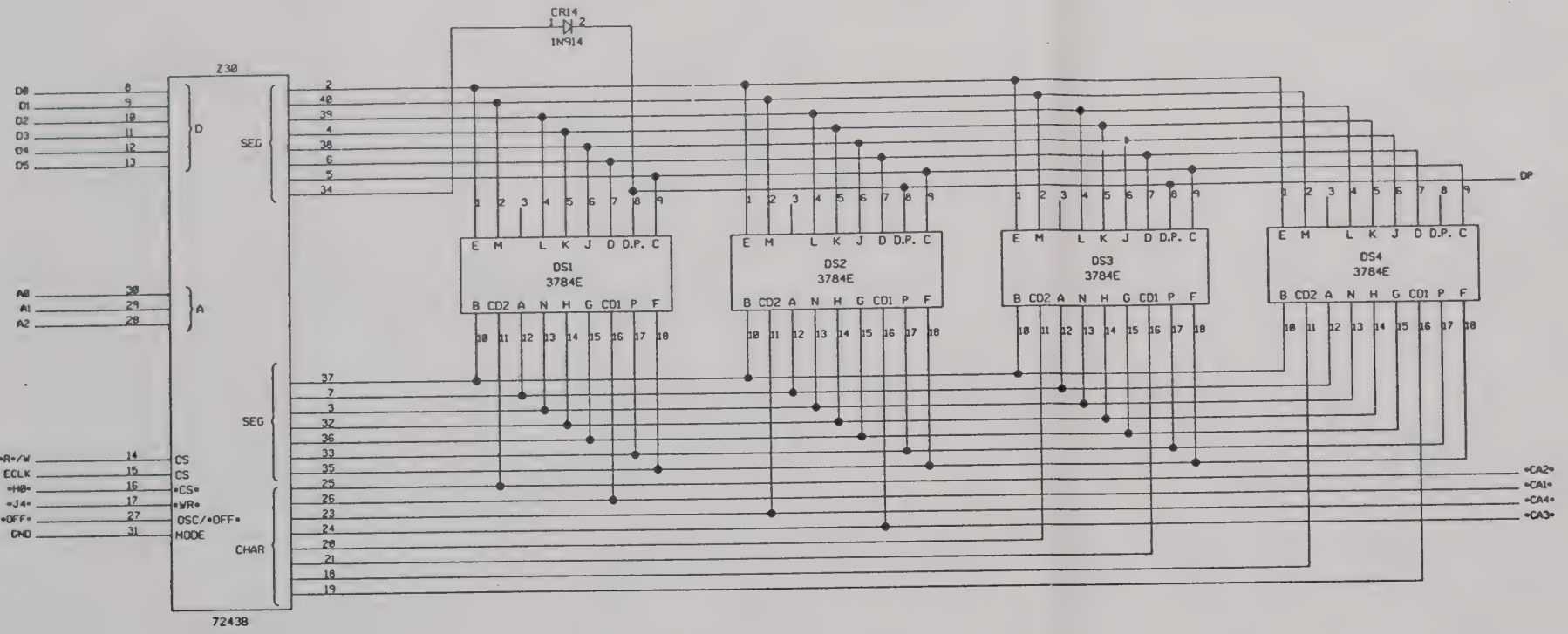
SCALE —— DO NOT SCALE DRAWING SHEET 1 OF 6

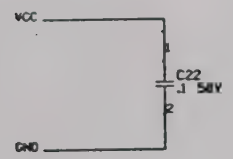
VCC
GND
AS
RN2 10K
Z2
74HC373
RN3 10K
Z3
74HC373
•PXE•
AS
X0
X1
X2
LOCK
Z5
EPROM 32K X 8
27256
A13
A14
JM2
ROMSEL
CE
OE
BROTHER BOARD
605-A0-XX
C13 .1 50V
C23 .1 50V
C24 .1 50V
C25 .1 50V
C26 .1 50V
C27 .1 50V
C28 .1 50V
VCC
GND
+10V
C30 .01
ANAGND
Z4
STATIC RAM
8192 X 8
8191
6116
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
•WS•
VCC
•HI•
•R/W•
FIN
WE
CS2
CS1
OE
D0
D1
D2
D3
D4
D5
D6
D7
+10V
Z27
4069
UNUSED
JM3
JM4
P6 - 22
P6 - 20
P6 - 18
P6 - 19
GND
P6 - 21
VCC
P6 - 1
D0
P6 - 4
D1
P6 - 3
D2
P6 - 6
D3
P6 - 5
D4
P6 - 8
D5
P6 - 7
A0
P6 - 9
A1
P6 - 12
A2
P6 - 11
•R/W
P6 - 13
ECLK
P6 - 14
•HI•
P6 - 16
•J4•
P6 - 15
OSC/•OFF•
P6 - 17
GND
P6 - 2
•CA1•
P6 - 28
•CA2•
P6 - 25
•CA3•
P6 - 26
•CA4•
P6 - 27
DP
P6 - 24
SIGN
P6 - 29
LOCK
P6 - 10
CHG GND
P6 - 30
P6 - 23
VIN
+10V
R38 100
C8 .01
C9 .01
C10 .01
ANAGND
-5V
LF356
Z26
C12 470PF
R42 270K
R39 4.7K
R40 4.7K
R41 100K
CR3 1N914
CR4 1N914
Z27 4069
Z28 4013
R43 4.7K
R44 4.7K
JM8
FOUT
P10-4
P10-3
P10-2
P10-1
Q5 220-7200
R50 11K 1%
R51 20K
R52 27.1K 1%
+10V
P12 - 1
P12 - 2
R46 22K
FIN
C29 470PF
R45 22K
2N3415 Q4
ANAGND
Z10
CTRDIV16
74HC393
GND
76.8KHZ
ECLK
J1 - 1
J1 - 3
J1 - 4
J1 - 2
J1 - 6
J1 - 5
VIN
-5V
ANAGND
+10V
J1 - 7
J1 - 10
J1 - 9
J1 - 8
P14
P13
P12
P11
P10
X2
X1
X0
J2 - 5
J2 - 4
J2 - 3
J2 - 2
J2 - 1
J2 - 8
J2 - 7
J2 - 6

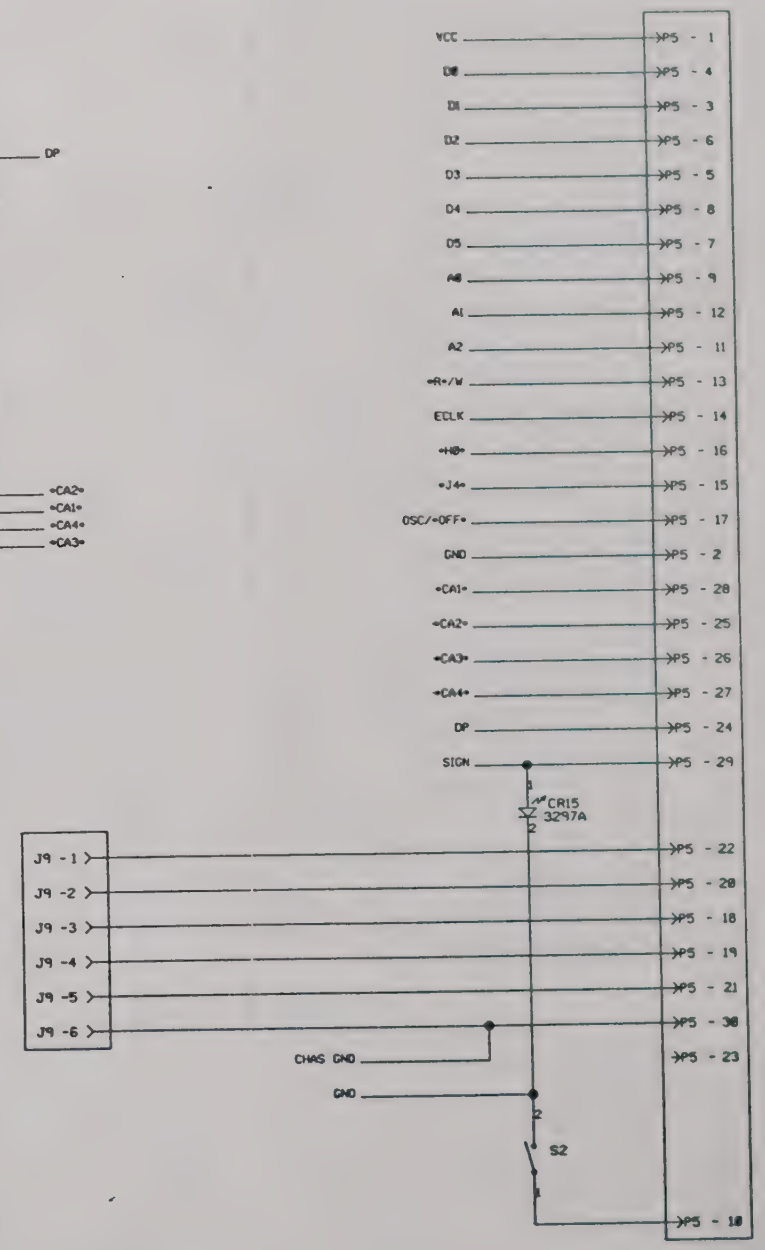
SIZE	CODE IDENT NO.	DRAWING NO.	REVISION LETTER
D		605-6300-02	B
SCALE —	DO NOT SCALE DRAWING	SHEET 3 OF 6	



SIZE	CODE IDENT NO.	DRAWING NO.
D		605-6300-02
SCALE —	DO NOT SCALE DRAWING	SHEET 4

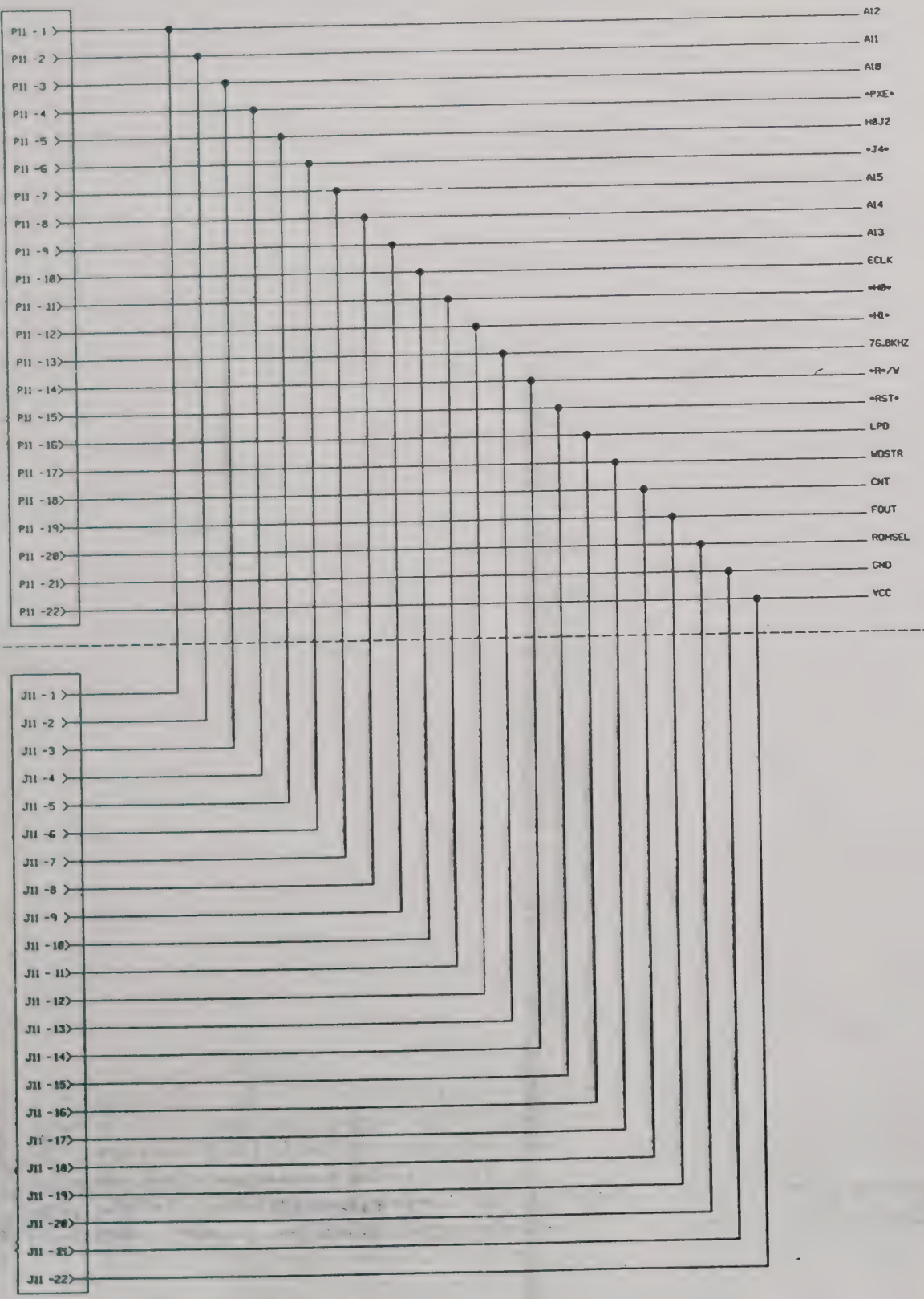






SIZE	CODE IDENT NO.	DRAWING NO.	REVISION LETTER
D		605-6300-02	B
SCALE ——	DO NOT SCALE DRAWING	SHEET 5 OF 6	

BROTHER BOARD
605-4390-XX

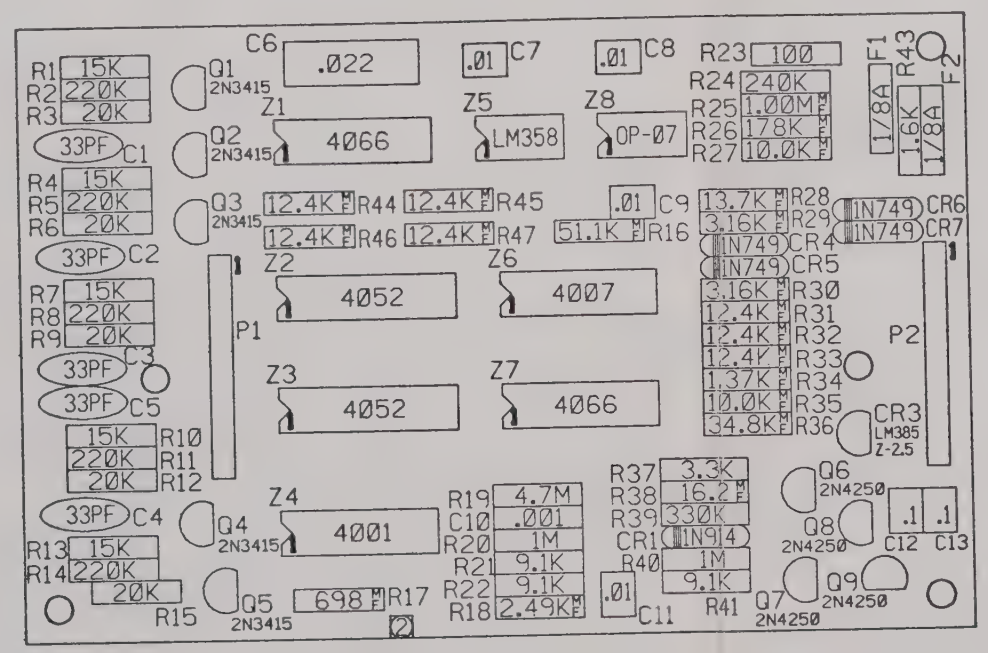


SIZE	CODE IDENT NO.	DRAWING NO.
D		605-6300-02
SCALE ——	DO NOT SCALE DRAWING	SHEET

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	BLM	[illegible]	J.CRABTREE
		A1	ILTO USAGE REL PER E.O. 2-11623	DV	[illegible]	J.CRABTREE
	00	B	PROD REL PER E.O. 2-11756	DV	[illegible]	J.CRABTREE
	00	C	PROD REL PER E.O. 2-11747	30 Jan 86	[illegible]	[illegible]

NOTES: UNLESS OTHERWISE SPECIFIED

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK CHARACTERS ON FAR (SOLDER) SIDE.
3. CAPACITORS ARE IN MICROFARADS EXCEPT AS NOTED.
4. TRIM ALL COMPONENT LEADS TO .062 MAX.
5. FOR MATERIAL LIST, SEE SHEETS 2 THRU 4.



HOLE TOLERANCES	NOTES UNLESS SPECIFIED	DRAWN	H.LAM	01-31-85	DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO, CA 92123	
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.03 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	CHECK	BLM BES	3-27-85		
SUPERSEDES		APPR.	J.CRABTREE	3-29-85	TITLE ASSEMBLY, PCB, RTD INPUT BD	
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION WHICH SHALL NOT BE REPRODUCED OR TRANSFERRED TO OTHER DOCUMENTS OR DISCLOSED TO OTHERS OR USED FOR MANUFACTURING OR ANY OTHER PURPOSE WITHOUT PRIOR WRITTEN PERMISSION OF DORIC SCIENTIFIC.	USED ON 600/700	MATERIAL			SIZE C	CODE IDENT. NO.
	NEXT ASSY. 605-802X-XX	FINISH			DRAWING NO. 605-4330-00	CHANGE LETTER C
					SCALE 1:1	DO NOT SCALE DRAWING SHEET 1 OF 5

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	[illegible]	3-27-85	[signature]
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	[signature]	8/30/85	[signature]
	B	PRODUCTION RELEASE PER E.O. 2-11656	[signature]	11/18/85	[signature]
	C	REVISED PER E.O. 2-11747	[signature]	4/8/86	[signature]

NOTE: SHEET 1 IS ASSEMBLY DRAWING

NOTES UNLESS SPECIFIED 1. TOLERANCES .xx ± .03 DIMENSIONED .xxx ± .010 ANGLES ± ½° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	R. GRAVES	2/6/85
	CHECK	[signature]	3-27-85
	APPR.	[signature]	3/29/85
	MATERIAL		

DORIC DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSEMBLY, PCB, RTD INPUT BD.

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4330-00	C
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 5

DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

MATERIAL LIST

DRAWING TITLE	ML	DRAWING NO.	REV.
ASSEMBLY, PCB, RTD INPUT BD.	MODEL NO. 600	DATE 2-6-85	SHEET 3 OF 5

ITEM NO.	DRAWING TITLE	DRAWING NO.	NO. REQ.	REMARKS
1	PCB, RTD INPUT	605-2330-01	1	
2	SCHEMATIC, RTD INPUT	605-6330-00	1	
3	TEST SPEC			
4				
5				
6	IC, LIN, AMP/OAMP OP07-CP	965-607-00	1	Z8
7	IC, LIN, AMP/OAMP LM358	965-617-00	1	Z5
8	IC, DIG, CMOS 4066	965-587-06	2	Z1,Z7
9	IC, DIG, CMOS 4001	965-587-01	1	Z4
10	IC, DIG, CMOS 4052	965-5870-80	2	Z2,Z3
11	IC, DIG, CMOS 4007	965-5870-87	1	Z6
12				
13				
14	RES, CARBON, 1/4 W 5%, 100	942-201-01	1	R23
15				
16	RES, CARBON, 1/4 W 5%, 1.6K	942-2016-02	1	R43
17	RES, CARBON, 1/4 W 5%, 3.3K	942-203-32	1	R37
18	RES, CARBON, 1/4 W 5%, 9.1K	942-209-12	3	R21,22,41
19	RES, CARBON, 1/4 W 5%, 15K	942-201-53	5	R1,4,7,10,13
20	RES, CARBON, 1/4 W 5%, 220K	942-202-24	5	R2,5,8,11,14
21	RES, CARBON, 1/4 W 5%, 20K	942-202-03	5	R3,6,9,12,15
22	RES, CARBON, 1/4 W 5%, 240K	942-2024-03	1	R24
23	RES, CARBON, 1/4 W 5%, 330K	942-203-34	1	R39
24	RES, CARBON, 1/4 W 5%, 1M	942-201-05	2	R20,40

DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

MATERIAL LIST

DRAWING TITLE	ML	DRAWING NO.	REV
ASSEMBLY, PCB, RTD INPUT BD.		605-4330-00	C
	MODEL NO. 600	DATE 2-6-85	SHEET 4 OF 5

ITEM NO.	DRAWING TITLE	DRAWING NO.	NO. REQ.	REMARKS
25	RES, CARBON, 1/4W 5%, 4.7M	942-204-75	1	R19
26	RES, METAL FILM,1/4W 1%, 10.0K	924-4100-02	2	R27,35
27	RES, METAL FILM,1/4W 1%, 13.7K	924-4137-02	1	R28
28	RES, METAL FILM,1/4W 1%, 34.8K	924-4348-02	1	R36
29	RES, METAL FILM,1/4W 1%, 51.1K	924-4511-02	1	R16
30	RES, METAL FILM,1/4W 1%, 178K	924-4178-03	1	R26
31	RES, METAL FILM,1/4W 1%, 1.00M	924-4100-04	1	R25
32	RES, METAL FILM,1/4W 1%, 16.2	924-2016-29	1	R38
33	RES, METAL FILM,1/4W 1%, 2.49K	924-2249-01	1	R18
34	RES, METAL FILM,1/4W .1%, 3.16K	924-2316-00	2	R29,30
35	RES, METAL FILM,1/4W .1%, 12.4K	924-2124-02	7	R31,32,33,44-47
36	RES, METAL FILM,1/4W 1%,698	924-469-80	1	R17
37	RES, METAL FILM,1/4W .1%,1.37K	924-2137-01	1	R34
38				
39	CAP, POLYPROPYLENE, .022 µF	918-0022-20	1	C6
40	CAP, DISC, 33PF	901-013-30	5	C1-5
41	CAP, CERAMIC, .001µF	900-021-09	1	C10
42	CAP, CERAMIC, .01 µF	900-021-01	4	C7,8,9,11
43	CAP, CERAMIC, .1 µF	900-021-02	2	C12, C13
44	DIODE, LM385Z-2.5	961-3850-01	1	CR3
45	DIODE, 1N914	961-091-40	1	CR1
46	XSTR, 2N3415	962-341-50	5	Q1-5
47	XSTR, 2N4250	962-425-01	4	Q6-9
48	FUSE, 1/8 AMP, 125V	971-0000-06	2	F1,2

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MATERIAL LIST

DRAWING TITLE	ML	DRAWING NO.	REV.
ASSEMBLY, PCB, RTD INPUT BD.		605-4330-00	C
	MODEL NO. 600	DATE 2-6-85	SHEET 5 OF 5

ITEM NO.	DRAWING TITLE	DRAWING NO.	NO. REQ.	REMARKS
49	DIODE, 1N749A	961-074-91	4	CR4-CR7
50	CONN., 10 PIN, HEADER	973-3500-25	2	P1,P2

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		A	[illegible]	[illegible]	[illegible]	[illegible]
		B	[illegible]	[illegible]	[illegible]	[illegible]
		C	[illegible]	[illegible]	[illegible]	[illegible]
		D	REVISED PER E.C.O. 2-11147	[illegible]	[illegible]	[illegible]

NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
2. CAPACITOR VALUES ARE IN MICROFARADS.
3. SEE CHART FOR IC PWR AND GND CONNECTIONS.

REFERENCE DESIGNATORS		
REF DESIG	LAST USED	NOT USED
IC	Z8	
RESISTOR	R47	R42
CAPACITOR	C13	
DIODE	CR7	CR2
FUSE	F2	
TRANSISTOR	Q9	
CONNECTOR	P2	

I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	4066	14	V+	7	V-
Z2	4052	16	V+	8	V-
Z3	4052	16	V+	8	V-
Z4	4001	14	V+	7	V-
Z5	LM358	SEE SCHEMATIC			
Z6	4007	14	V+	7	V-
Z7	4066	14	V+	7	V-
Z8	OP07-CP	SEE SCHEMATIC			

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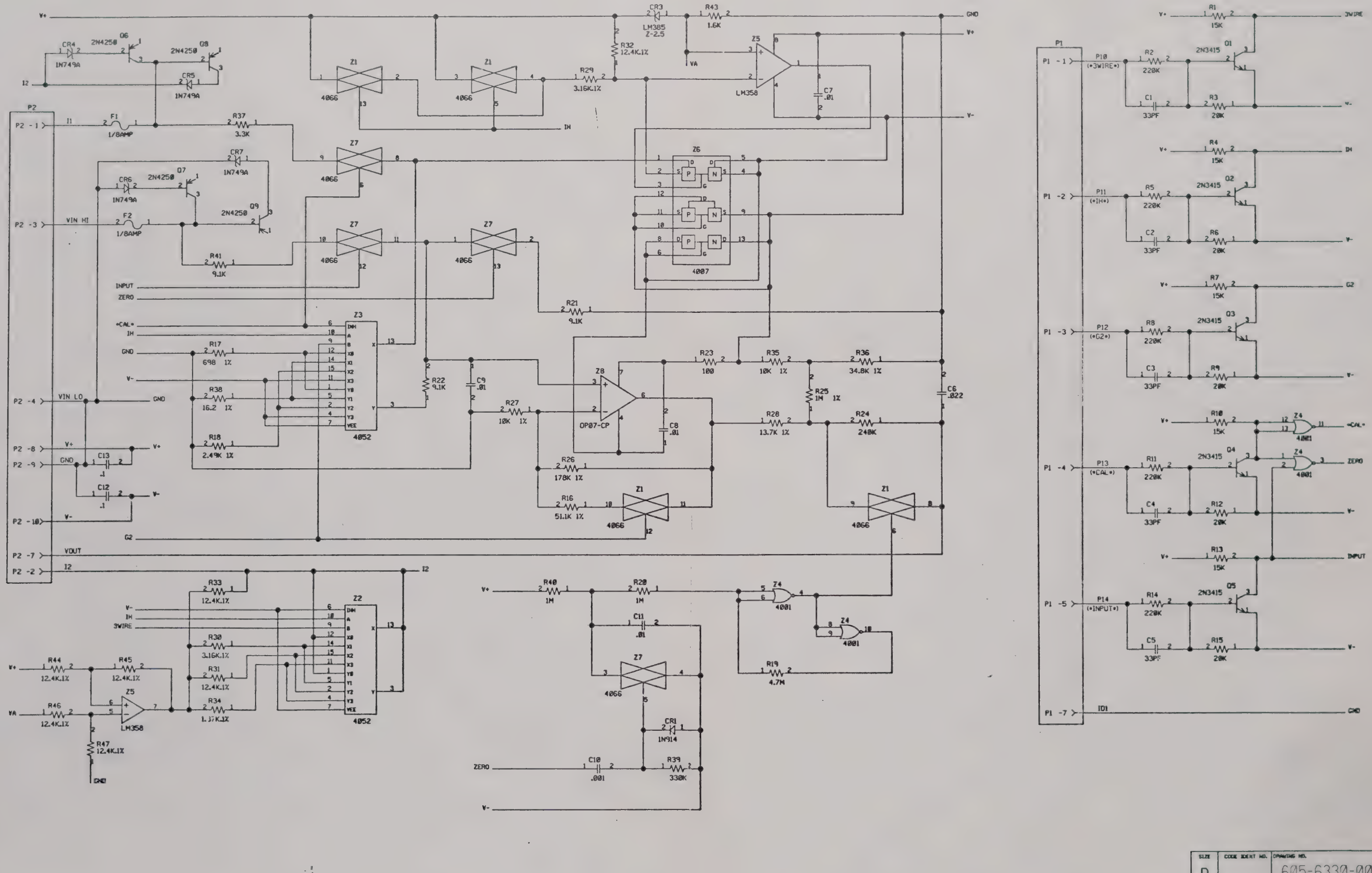
ASSY.NO. 605-4330-XX	SUPERSEDES		
	DRAWN	S. DUONG	7-85
	CHECK	B.SINOFSKY	8/30/85
	DES/ENG	B.SINOFSKY	8/30/85
	APPR.		

DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, RTD INPUT BOARD

SIZE: D | DRAWING NO.: 605-6330-00 | CHANGE LETTER: D

SCALE: —— | DO NOT SCALE DRAWING | SHEET 1 OF 2

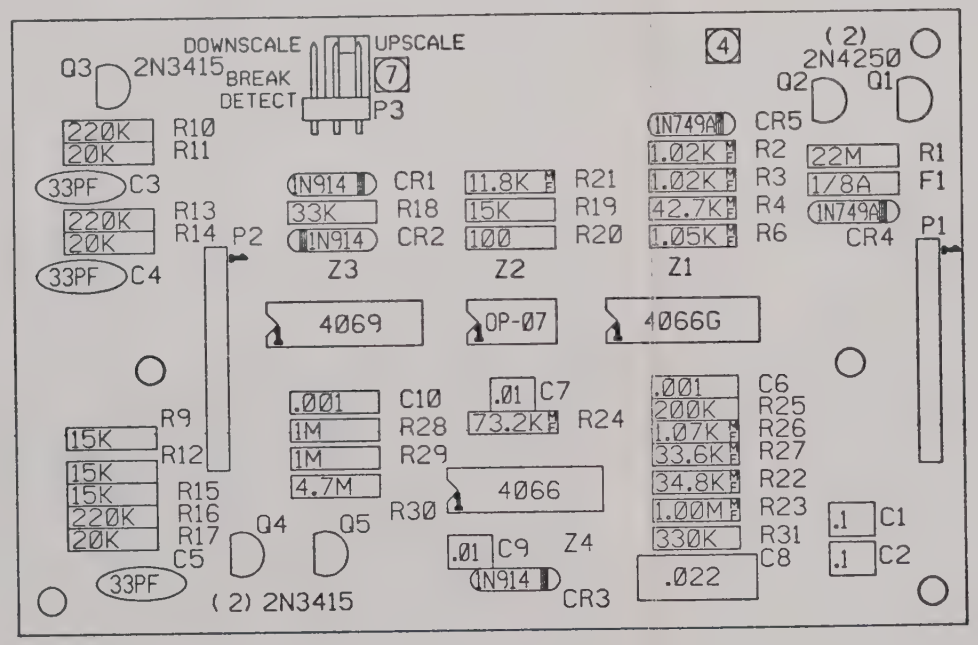


SIZE	CODE IDENT NO.	DRAWING NO.	SHEET LETTER
D		605-6330-00	D

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	BES	03/29/85	J.CRABTREE
		A1	LTD USAGE REL PER EO2-11603	D.Y.	[illegible]	J.CRABTREE
		A2	REVISED PER EO2-11683	[illegible]	[illegible]	J.CRABTREE
		B	PROD. REL. PER EO2-11656	[illegible]	[illegible]	[illegible]

NOTES: UNLESS OTHERWISE SPECIFIED .

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003 .
2. RESISTANCE IN OHMS .
3. CAPACITANCE IN MICROFARADS .
4. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON SOLDER SIDE .
5. TRIM ALL COMPONENT LEADS TO .062 MAX.
6. FOR MATERIAL LIST SEE SHEETS 2 THRU 4.
7. INSTALL CONNECTOR JUMPER (PN 991-0100-50) 1 PLACE .



HOLE TOLERANCES	NOTES UNLESS SPECIFIED				DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3881 RUFFIN ROAD SAN DIEGO, CA 92123	
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.03 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	S. DUONG	3-15-85	TITLE	
SUPERSEDES		CHECK	B.E.S. B.L.M.	3-29-85	ASSEMBLY, PCB THERMOCOUPLE INPUT	
		APPR.	J.CRABTREE	3-29-85		
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION WHICH SHALL NOT BE REPRODUCED OR TRANSFERRED TO OTHER DOCUMENTS OR DISCLOSED TO OTHERS OR USED FOR MANUFACTURING OR ANY OTHER PURPOSE WITHOUT PRIOR WRITTEN PERMISSION OF DORIC SCIENTIFIC.	USED ON 600/700 NEXT ASSY. 605-802X-XX	MATERIAL			SIZE C	CODE IDENT. NO.	DRAWING NO. 605-4340-00	CHANGE LETTER B
		FINISH			SCALE 1:1	DO NOT SCALE DRAWING	SHEET 1 OF 4	

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	[illegible]	3-27-85	[signature]
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	[signature]	9/3/85	[signature]
	A2	REVISED PER E.O. 2-11683	[signature]	12/16/85	[signature]
	B	PRODUCTION RELEASE PER E.O. 2-11656	[signature]	12/18/85	[signature]

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED			
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°	DRAWN	S. DUONG	3/21/85
2. BREAK ALL SHARP EDGES .010 APPROX.	CHECK	[signature] BLS	3-27-85
3. MACH. SURFACES √	APPR.	[signature]	3/28/85
4. ALL DIM. IN INCHES	MATERIAL		
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSY, PCB, THERMOCOUPLE INPUT

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4340-00	B
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 4

MPS 41-70-001 DORIC

PARTS LIST

Part No: 600TC
Revision:

DORIC ASSY, PCB, THERMOCOUPLE INPUT 605-4340-00 B

20-MAR-85

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	IC, GRADED 4066	4066G	Z1	000-8130-00	
2	1	IC, DIG, QUAD BILATERAL SWITCH	4066	Z4	965-587-06	
3	1	IC, DIG, HEX INVERTING BUFFER	4069	Z3	965-587-05	
4	2	CAP RADIAL .01 @ 50V	900-021-01	C7,C9	900-021-01	
5	2	CAP RADIAL .1 @ 50V	900-021-02	C1,C2	900-021-02	
6	2	CAP AXIAL .001 @ 50V	900-021-09	C10,C6	900-021-09	
7	3	CAP DISC 33PF @ 1KV	901-013-30	C3,C4,C5	901-013-30	
8	1	CAP POLYPROP .022 @ 200V 10%	918-0022-20	C8	918-0022-20	
9	1	RES MF RN55C 1.0% 1.00M	924-4100-04	R23	924-4100-04	
10	2	RES MF RN55C 1.0% 1.02K	924-4102-01	R2,R3	924-4102-01	
11	1	RES MF RN55C 0.1% 1.05K	924-4105-01	R6	924-4105-01	
12	1	RES MF RN55C 0.1% 1.07K	924-4107-01	R26	924-4107-01	
13	1	RES MF RN55C 1.0% 11.8K	924-4118-02	R21	924-4118-02	
14	1	RES MF RN55C 0.1% 42.7K	924-4270-01	R4	924-4270-01	
15	1	RES MF RN55C 0.1% 33.6K	924-4336-02	R27	924-4336-02	
16	1	RES MF RN55C 1.0% 34.8K	924-4348-02	R22	924-4348-02	
17	1	RES MF RN55C 1.0% 73.2K	924-4732-02	R24	924-4732-02	
18	1	RES CBN 1/4W 5% 100 OHM	942-201-01	R20	942-201-01	
19	2	RES CBN 1/4W 5% 1M	942-201-05	R28,R29	942-201-05	
20	4	RES CBN 1/4W 5% 15K	942-201-53	R12,R15,R19,R9	942-201-53	
21	3	RES CBN 1/4W 5% 20K	942-202-03	R11,R14,R17	942-202-03	
22	3	RES CBN 1/4W 5% 220K	942-202-24	R10,R13,R16	942-202-24	
23	1	RES CBN 1/4W 5% 22M	942-202-26	R1	942-202-26	

PARTS LIST

DORIC ASSY, PCB, THERMOCOUPLE INPUT 605-4340-00 B

Part No: 600TC
Revision:

20-MAR-85

Item No.	Qty Reqd	Description / Identification		Reference Designation	Part Number	See Note
24	1	RES CBN 1/4W 5% 200K	942-2020-04	R25	942-2020-04	
25	1	RES CBN 1/4W 5% 33K	942-203-33	R18	942-203-33	
26	1	RES CBN 1/4W 5% 330K	942-203-34	R31	942-203-34	
27	1	RES CBN 1/4W 5% 4.7M	942-204-75	R30	942-204-75	
28	3	DIODE 1N914 (1N4148)	961-091-40	CR1,CR2,CR3	961-091-40	
29	3	XSTR 2N3415 NPN	962-341-50	Q3,Q4,Q5	962-341-50	
30	2	XSTR PN4250A PNP	962-425-01	Q1,Q2	962-425-01	
31	1	IC OP-07 PREC OPAMP	965-607-00	Z2	965-607-00	
32	1	FUSE PICO AXIAL PIGTAIL NB 1/8A	971-0000-06	F1	971-0000-06	
33	2	CONN, 10 PIN HEADER	973-3500-25	P1,P2	973-3500-25	
34	1	CONN, 3 PIN HEADER, RT ANGLE	973-0101-32	P3	973-0101-32	
35	1	CONN, JUMPER, 2 POS	991-0100-50	(P3)	991-0100-50	
36	1	PCB, THERMOCOUPLE INPUT BOARD	605-2340-01		605-2340-01	
37	1	SCHEM, THERMOCOUPLE INPUT BOARD	605-6340-00		605-6340-00	
38	2	DIODE, 1N749A	961-074-91	CR4,CR5	961-074-91	

8	7	6	5	4	3	2	1

NOTES: UNLESS OTHERWISE SPECIFIED.

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5% .
2. CAPACITOR VALUES ARE IN MICROFARADS.

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	REG	6-12-85	J.CRABTREE
		A1	LTD MCARE REL PER ECO-11602	REG	6-12-85	J.CRABTREE
		A2	[illegible]	[illegible]	[illegible]	[illegible]
		B	PROD. REL. PER ECO-11606	[illegible]	[illegible]	[illegible]

REFERENCE DESIGNATORS		
REF DES	LAST USED	DO NOT USE
RESISTOR	R31	
CAPACITOR	C10	
TRANSISTOR	Q5	
DIODE	CR5	
IC	Z4	
CONNECTOR	P3	
FUSE	F1	

I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	4066C	14	V+	7	V-
Z2	OP-07	SEE SCHEMATIC			
Z3	4069	14	V+	7	V-
Z4	4066	14	V+	7	V-

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ASSY.NO. 605-4340-XX	SUPERSEDES ———		
	DRAWN	S. DUONG	1-29-85
	CHECK	R.E.G.	6-12-85
	DES/ENG	R.E. GRIPPEN	6-12-85
	APPR.	J. CRABTREE	6-12-85

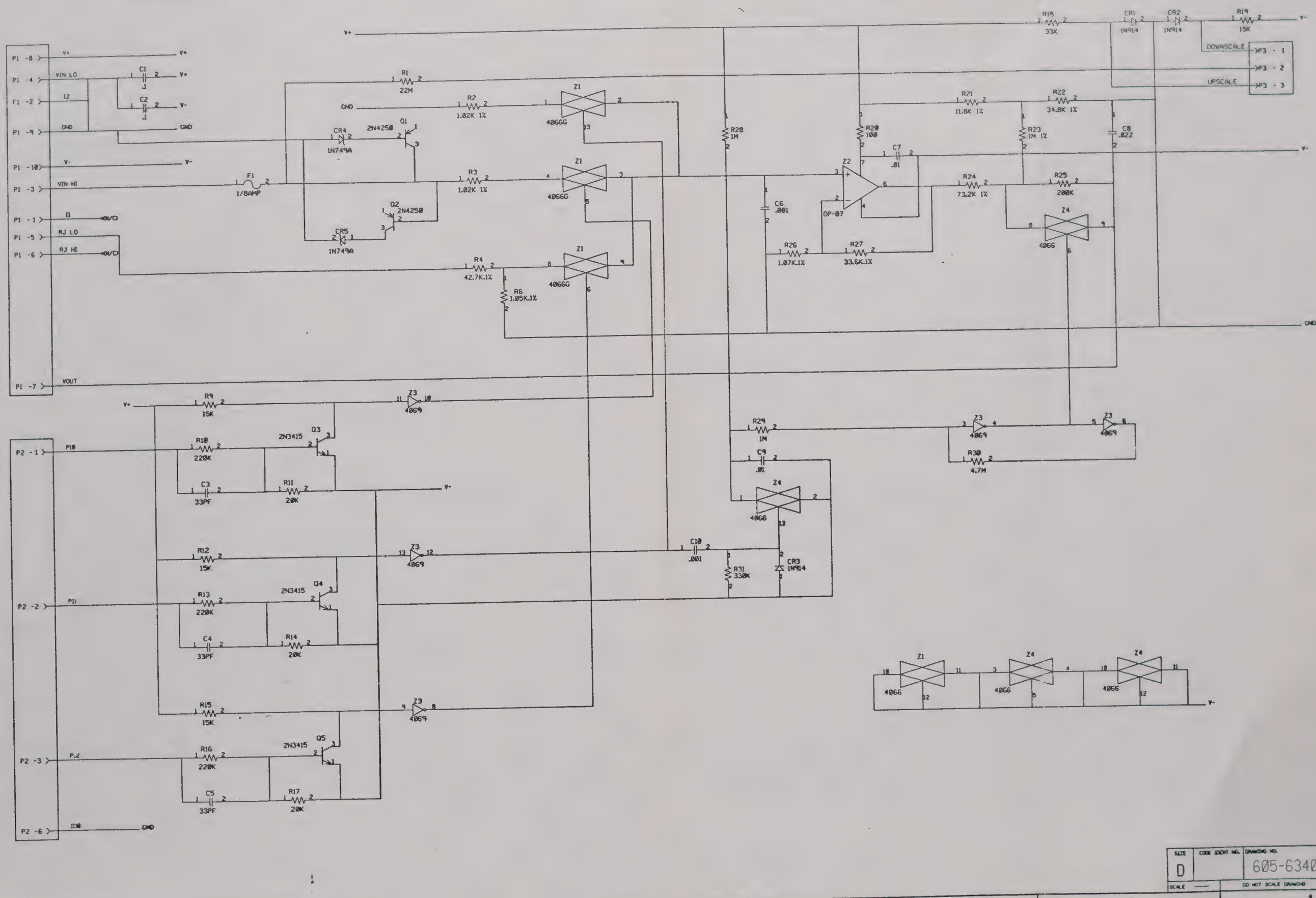
DORIC — DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, T/C INPUT

SIZE	DRAWING NO.	DRAWING REVISION
D	605-6340-00	B

SCALE ——— DO NOT SCALE DRAWING SHEET 1 OF 2

8	7	6	5	4	3	2	1

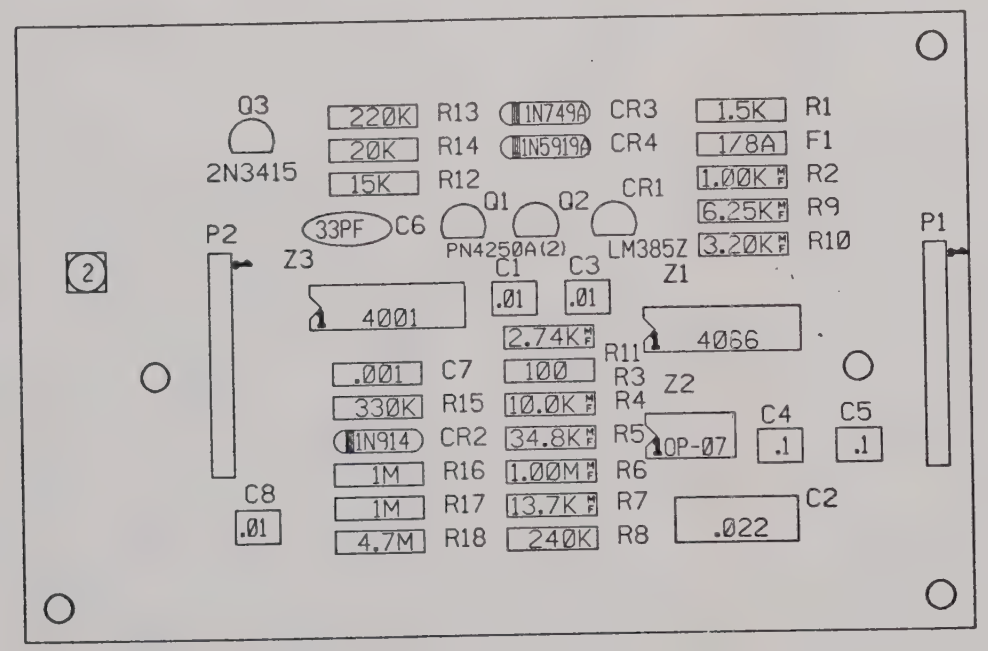


SIZE	CODE IDENT NO.	DRAWING NO.	DRAWING LETTER
D		605-6340-00	B
SCALE —	DO NOT SCALE DRAWING	SHEET 2 OF 2	

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	BLM	03/27/85	J.CRABTREE
		A	LTD USAGE REL PER EO 2-11628	BLM	12/3/85	
		B	PROD REL PER E.O. 2-11656		12/19/85	

NOTES: UNLESS OTHERWISE SPECIFIED

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON FAR (SOLDER) SIDE.
3. TRIM ALL COMPONENT LEADS TO .062 MAX.
4. FOR MATERIAL LIST, SEE SHEETS 2 THRU 4.



HOLE TOLERANCES	NOTES UNLESS SPECIFIED			
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.03 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	H. LAM	03-15-85
		CHECK	B.L.M. B.E.S.	03-27-85
		APPR.	J.CRABTREE	03-29-85
SUPERSEDES		MATERIAL		
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION WHICH SHALL NOT BE REPRODUCED OR TRANSFERRED TO OTHER DOCUMENTS OR DISCLOSED TO OTHERS OR USED FOR MANUFACTURING OR ANY OTHER PURPOSE WITHOUT PRIOR WRITTEN PERMISSION OF DORIC SCIENTIFIC.	USED ON 600/700 NEXT ASSY. 605-802X-XX	FINISH		

DORIC — DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO, CA 92123

TITLE: ASSEMBLY, PCB, THERMISTOR INPUT BD

SIZE	CODE IDENT. NO.	DRAWING NO.	CHANGE LETTER
C		605-4350-00	B

SCALE 1:1 | DO NOT SCALE DRAWING | SHEET 1 OF 4

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	[illegible]	3-27-85	J. Crabtree
	A1	LIMITED USAGE RELEASE PER E.O. 2-11628	[illegible]	9/24/85	J Crabtree
	B	PRODUCTION RELEASE PER E.O. 2-11656	DV	12/18/85	J Crabtree

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED	DRAWN	H. LAM	3/24/85
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	CHECK	[illegible]	3-27-85
	APPR.	J. Crabtree	3/29/85
	MATERIAL		

DORIC — DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSEMBLY, PCB, THERMISTOR INPUT BOARD

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4350-00	B
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 4

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	IC, DIGITAL, QUAD 2-INPUT NOR	4001	Z3	965-587-01	
2	1	IC, DIG, QUAD BILATERAL SWITCH	4066	Z1	965-587-06	
3	3	CAP RADIAL .01 @ 50V	900-021-01	C1,C3,C8	900-021-01	
4	2	CAP RADIAL .1 @ 50V	900-021-02	C4,C5	900-021-02	
5	1	CAP AXIAL .001 @ 50V	900-021-09	C7	900-021-09	
6	1	CAP DISC 33PF @ 1KV	901-013-30	C6	901-013-30	
7	1	CAP POLYPROP .022 @ 200V 10%	918-0022-20	C2	918-0022-20	
8	1	RES MF RN55E 0.1% 3.20K	922-432-01	R10	922-432-01	
9	1	RES MF RN55E 0.1% 6.25K	922-462-51	R9	922-462-51	
10	1	RES MF RN55C 1.0% 1.00K	924-4100-01	R2	924-4100-01	
11	1	RES MF RN55C 1.0% 10.0K	924-4100-02	R4	924-4100-02	
12	1	RES MF RN55C 1.0% 1.00M	924-4100-04	R6	924-4100-04	
13	1	RES MF RN55C 1.0% 13.7K	924-4137-02	R7	924-4137-02	
14	1	RES MF RN55C 1.0% 2.74K	924-4274-01	R11	924-4274-01	
15	1	RES MF RN55C 1.0% 34.8K	924-4348-02	R5	924-4348-02	
16	1	RES CBN 1/4W 5% 100 OHM	942-201-01	R3	942-201-01	
17	2	RES CBN 1/4W 5% 1M	942-201-05	R16,R17	942-201-05	
18	1	RES CBN 1/4W 5% 1.5K	942-201-52	R1	942-201-52	
19	1	RES CBN 1/4W 5% 15K	942-201-53	R12	942-201-53	
20	1	RES CBN 1/4W 5% 20K	942-202-03	R14	942-202-03	
21	1	RES CBN 1/4W 5% 220K	942-202-24	R13	942-202-24	
22	1	RES CBN 1/4W 5% 240K	942-2024-03	R8	942-2024-03	

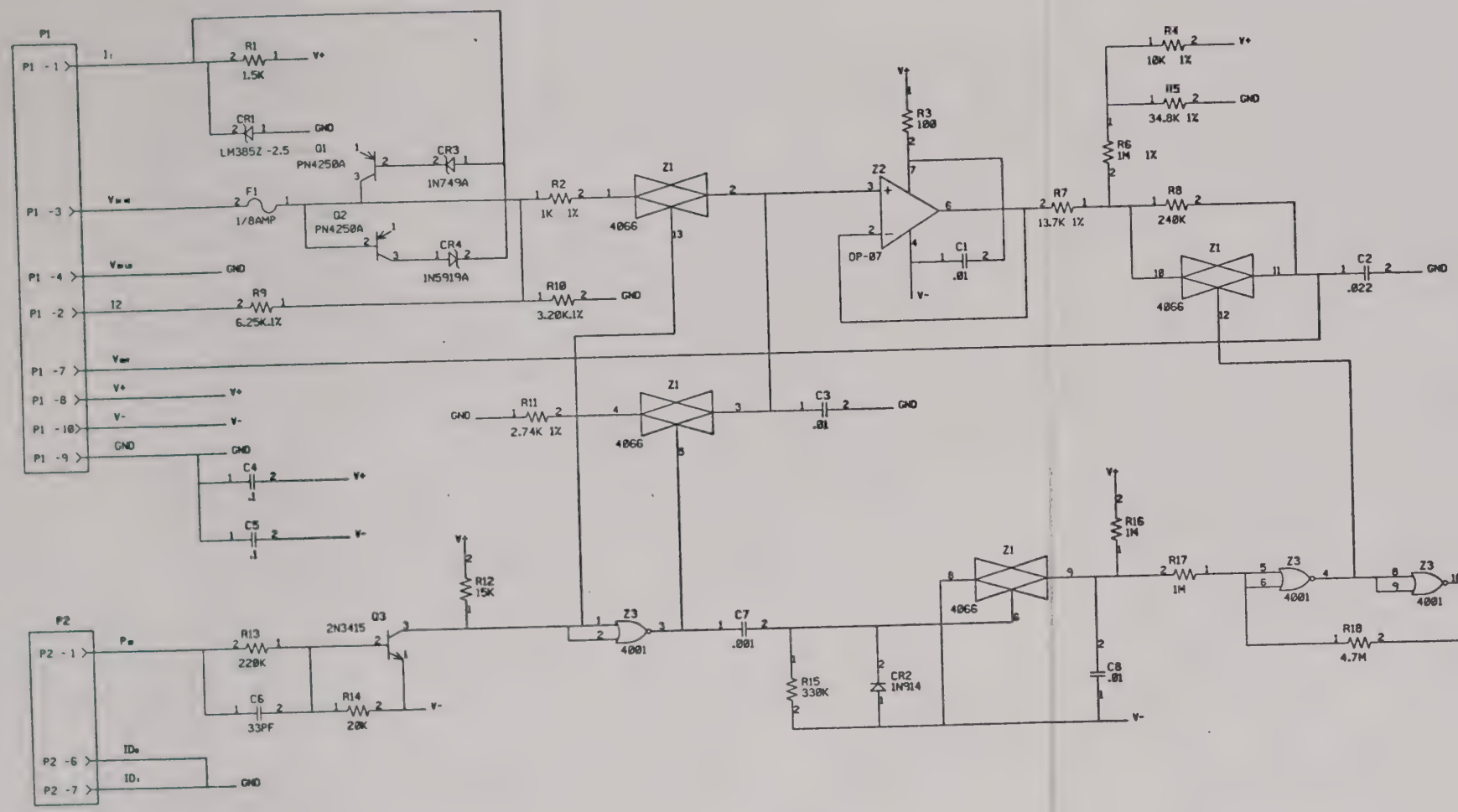
Item No.	Qty Reqd	Description / Identification		Reference Designation	Part Number	See Note
23	1	RES CBN 1/4W 5% 330K	942-203-34	R15	942-203-34	
24	1	RES CBN 1/4W 5% 4.7M	942-204-75	R18	942-204-75	
25	1	DIODE 1N914 (1N4148)	961-091-40	CR2	961-091-40	
26	1	DIODE LM385Z VOLT REF 2.5V	961-3850-01	CR1	961-3850-01	
27	1	XSTR 2N3415 NPN	962-341-50	Q3	962-341-50	
28	2	XSTR PN4250A PNP	962-425-01	Q1,Q2	962-425-01	
29	1	IC OP-07 PREC OPAMP	965-607-00	Z2	965-607-00	
30	1	FUSE PICO AXIAL PIGTAIL NB 1/8A	971-0000-06	F1	971-0000-06	
31	2	CONN, 10 PIN HEADER	973-3500-25	P1,P2	973-3500-25	
32	1	PCB, THERMISTOR INPUT BOARD	605-2350-00		605-2350-00	
33	1	SCHEM, THERMISTOR INPUT BOARD	605-6350-00		605-6350-00	
34	1	DIODE 1N749A	961-074-91	CR3	961-074-91	
35	1	DIODE 1N5919A	961-5919-56	CR4	961-5919-56	

8	7	6	5	4	3	2	1

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	BS	5/21/95	J.CRABTREE
		A1	LTD USAGE REL PER EO 2-11629	BS	9/12/95	
		B	PROD REL PER E.O. 2-11656	BS	10/17/95	

NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
2. CAPACITOR VALUES ARE IN MICROFARADS.



I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	4066	14	V+	7	V-
Z2	OP-07	SEE SCHEMATIC			
Z3	4001	14	V+	7	V-

REFERENCE DESIGNATORS		
REF DESG.	LAST USED	NOT USED
RESISTOR	R18	
CAPACITOR	C8	
TRANSISTOR	Q3	
DIODE	CR4	
I.C.	Z3	
FUSE	F1	
CONNECTOR	P2	

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ASSY.NO. 605-4350-XX	SUPERSEDES		
	DRAWN	H. LAM	3-4-95
	CHECK	B. SINOFSKY	5-21-95
	DES/ENG	B. SINOFSKY	5-21-95
	APPR.	B. SINOFSKY	5-21-95

DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO,CA 92123

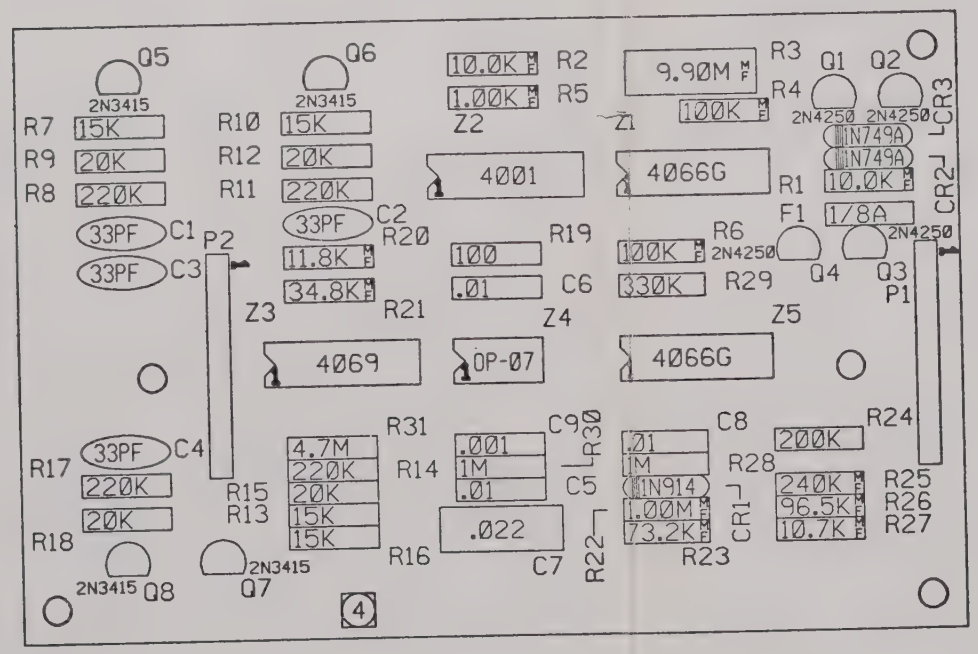
TITLE	SIZE	DRAWING NO.	CHANGE LETTER
SCHEMATIC, THERMISTOR INPUT BD	D	605-6350-00	B
	SCALE ——	DO NOT SCALE DRAWING	SHEET 1 OF 1

8	7	6	5	4	3	2	1

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	BLM	2/17/8	J.CRABTREE
		A1	LTD USAGE REL PER EO2-11602	DV	3/5/85	J.C.
		A2	REVISED PER E.O. 2-11633	SD	3/28/85	
		B	PROD REL PER E.O. 2-11656		4/8/85	

NOTES: UNLESS OTHERWISE SPECIFIED .

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003 .
2. RESISTANCE IN OHMS .
3. CAPACITANCE IN MICROFARADS .
4. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON SOLDER SIDE .
5. TRIM ALL COMPONENT LEADS TO .062 MAX.
6. FOR MATERIAL LIST SEE SHEETS 2 THRU 4 .



HOLE TOLERANCES	NOTES UNLESS SPECIFIED			
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.03 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	S. DUONG	3-15-85
		CHECK	B.L.M. B.E.S.	3-27-85
		APPR.	J. CRABTREE	3-29-85
SUPERSEDES		MATERIAL		
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	NEXT ASSY. 605-802X-XX			

DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO, CA 92123

TITLE
ASSEMBLY, PCB LINEAR VOLTAGE

SIZE	CODE IDENT. NO.	DRAWING NO.	CHANGE LETTER
C		605-4360-00	B

SCALE 2:1 | DO NOT SCALE DRAWING | SHEET 1 OF 4

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	[illegible]	3-27-85	J. Guthrie
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	[illegible]	9/5/85	J. Guthrie
	A2	REVISED PER E.O. 2-11633	SD	10/18/85	J. Guthrie
	B	PRODUCTION RELEASE PER E.O. 2-11656	[illegible]	2/18/85	J. Guthrie

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED			
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°	DRAWN	S. DUONG	3/21/85
2. BREAK ALL SHARP EDGES .010 APPROX.	CHECK	[illegible]	3-27-85
3. MACH. SURFACES √	APPR.	J. Guthrie	3/29/85
4. ALL DIM. IN INCHES	MATERIAL		
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3083 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSY, PCB, LINEAR VOLTAGE

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4360-00	B
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 4

Part No: 600LIN PARTS LIST
Revision: DORIC - ASSY, PCB LINEAR VOLTAGE 605-4360-00 B 24-AUG-85

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	IC, DIGITAL, QUAD 2-INPUT NOR	4001	Z2	965-587-01	
2	2	QUAD ANALOG SW/MULTIPLEXER (GRADED PART)	4066B	Z1,Z5	000-8130-00	
3	1	IC, DIG, HEX INVERTING BUFFER	4069	Z3	965-587-05	
4	3	CAP AXIAL .01 @ 50V	900-021-07	C5,C6,C8	900-021-07	
5	1	CAP AXIAL .001 @ 50V	900-021-09	C9	900-021-09	
6	4	CAP DISC 33PF @ 1KV	901-013-30	C1,C2,C3,C4	901-013-30	
7	1	CAP POLYPROP AXIAL 10% .022 @ 200V	918-0022-20	C7	918-0022-20	
8						
9	1	RES MF RN55C 1.0% 1.00K	924-4100-01	R5	924-4100-01	
10	2	RES MF RN55C 1.0% 10.0K	924-4100-02	R1,R2	924-4100-02	
11	1	RES MF RN55C 1.0% 100K	924-4100-03	R6	924-4100-03	
12	1	RES MF RN55C 1.0% 1.00M	924-4100-04	R22	924-4100-04	
13	1	RES MF MATCHEDSET .25% 9.90M & 100K	000-7790-00	R3,R4	000-7790-00	
14	1	RES MF RN55C 0.1% 10.7K	924-4107-02	R27	924-4107-02	
15	1	RES MF RN55C 1.0% 11.8K	924-4118-02	R20	924-4118-02	
16	1	RES MF RN55C 0.1% 240K	924-4240-03	R25	924-4240-03	
17	1	RES MF RN55C 1.0% 34.8K	924-4348-02	R21	924-4348-02	
18	1	RES MF RN55C 1.0% 73.2K	924-4732-02	R23	924-4732-02	
19	1	RES MF RN55C 0.1% 96.5K	924-4965-02	R26	924-4965-02	
20	1	RES CBN 1/4W 5% 100 OHM	942-201-01	R19	942-201-01	
21	2	RES CBN 1/4W 5% 1M	942-201-05	R28,R30	942-201-05	
22	4	RES CBN 1/4W 5% 15K	942-201-53	R10,R13,R16,R7	942-201-53	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
23	4	RES CBN 1/4W 5% 20K	942-202-03	R12,R15,R18,R9	942-202-03	
24	4	RES CBN 1/4W 5% 220K	942-202-24	R11,R14,R17,R8	942-202-24	
25	1	RES CBN 1/4W 5% 200K	942-2020-04	R24	942-2020-04	
26	1	RES CBN 1/4W 5% 330K	942-203-34	R29	942-203-34	
27	1	RES CBN 1/4W 5% 4.7M	942-204-75	R31	942-204-75	
28	1	DIODE 1N914 (1N4148)	961-091-40	CR1	961-091-40	
29	4	XSTR 2N3415 NPN	962-341-50	Q5,Q6,Q7,Q8	962-341-50	
30	4	XSTR 2N4250 PNP	962-425-00	Q1,Q2,Q3,Q4	962-425-00	
31	1	IC OP-07 PREC OPAMP	965-607-00	Z4	965-607-00	
32	1	FUSE PICO AXIAL PIGTAIL NB 1/8A	971-0000-06	F1	971-0000-06	
33	2	CONN 10 PIN HEADER	973-3500-25	P1,P2	973-3500-25	
34	1	PCB, LINEAR VOLTAGE BOARD	605-2360-00		605-2360-00	
35	1	SCHEM, LINEAR VOLTAGE BOARD	605-6360-00		605-6360-00	
36	2	DIODE, ZENER, 1N749A 4.3V, 5%	961-074-91	CR2,CR3	961-074-91	

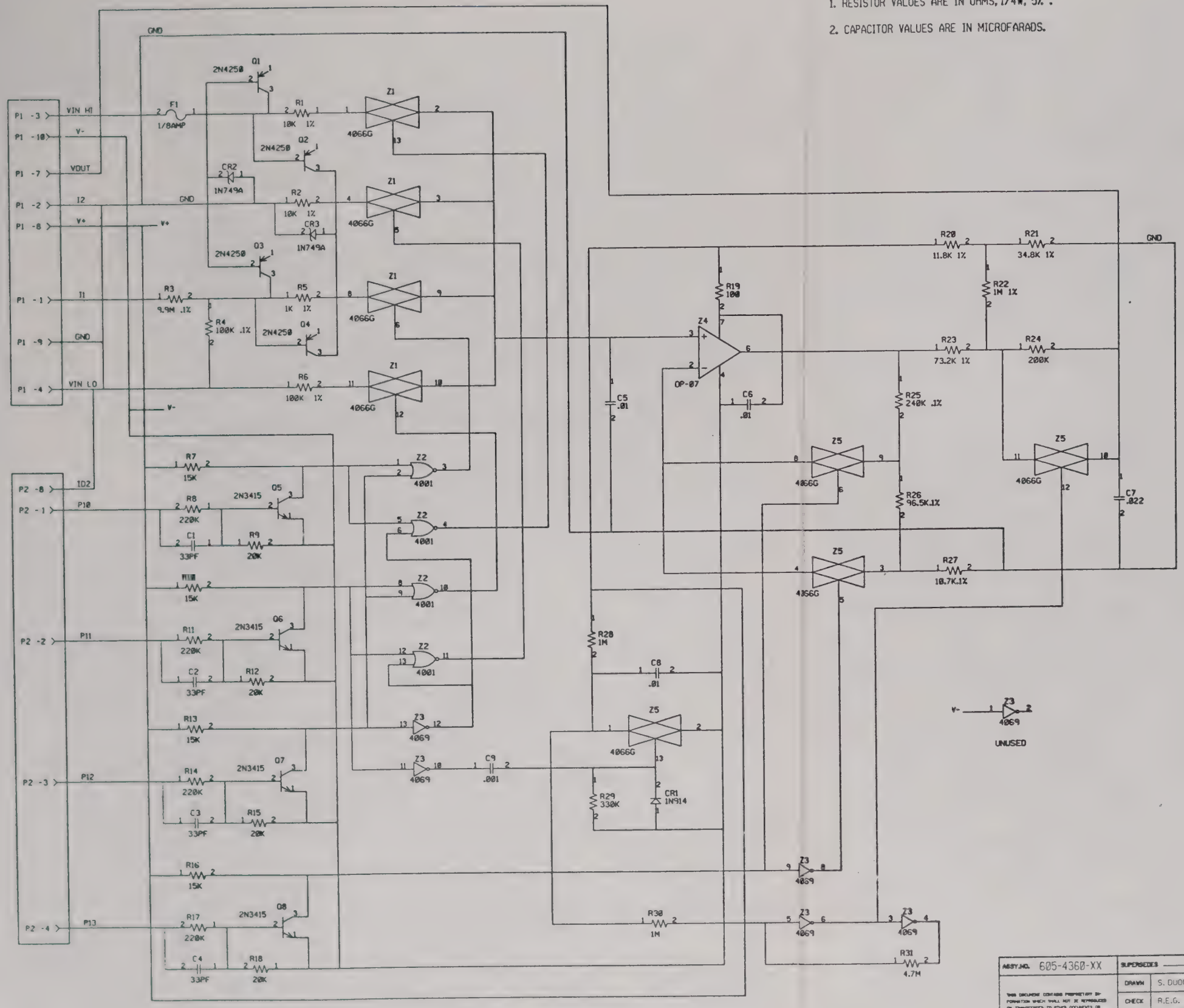
8	7	6	5	4	3	2	1

NOTES: UNLESS OTHERWISE SPECIFIED.

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5% .

2. CAPACITOR VALUES ARE IN MICROFARADS.

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X2	R & D RELEASE	REG	3/5/85	J.CRABTREE
		A1	LTD USAGE REL PER EO2-11800	BSM	5/6/85	
		B	PROD REL PER E.O. 2-11656	REG	6/12/85	



REFERENCE DESIGNATORS		
REF DES	LAST USED	DO NOT USE
RESISTOR	R31	
CAPACITOR	C9	
TRANSISTOR	Q8	
DIODE	CR3	
IC	Z5	
CONNECTOR	P2	
FUSE	F1	

I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	4066G	14	V+	7	V-
Z2	4001	14	V+	7	V-
Z3	4069	14	V+	7	V-
Z4	OP-07	SEE SCHEMATIC			
Z5	4066G	14	V+	7	V-

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ASSY.NO. 605-4360-XX	SUPERSEDES		
	DRAWN	S. DUONG	3-85
	CHECK	R.E.G.	6-5-85
	DES/ENG	R.E. GRIPPEN	6-5-85
	APPR.	J. CRABTREE	6-12-85

DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, LINEAR VOLTAGE

SIZE	DRAWING NO.	CHANGE LETTER
D	605-6360-00	B

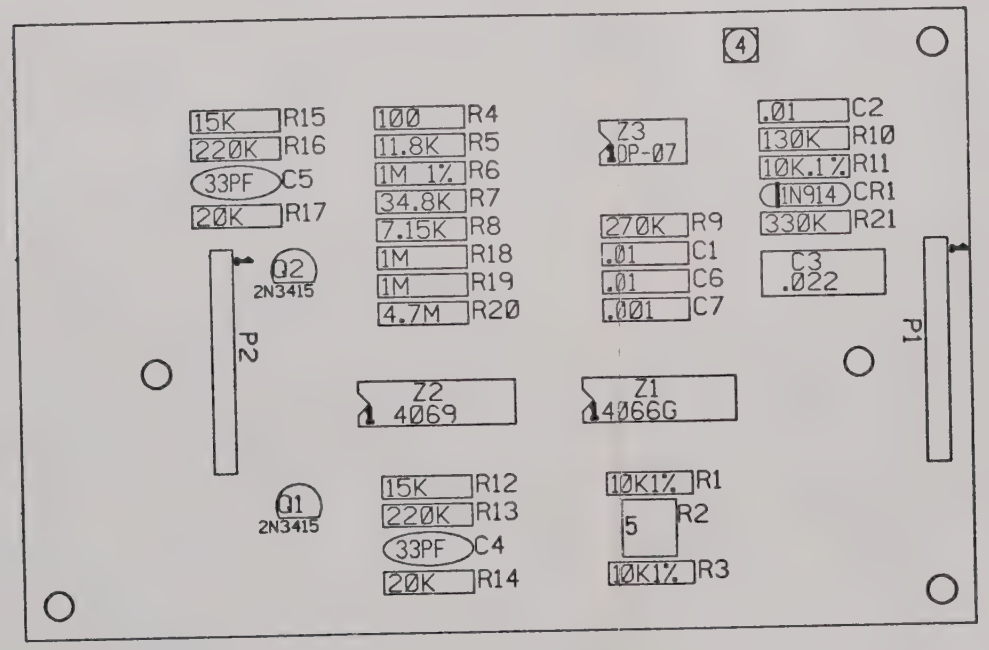
SCALE — DO NOT SCALE DRAWING SHEET 1 OF 1

8	7	6	5	4	3	2	1

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	BLM	3/27/85	J.CRABTREE
		A1	LTD USAGE REL PER ECO 2-11600	BLM	4/2/85	J.Crabtree
		B	PROD REL PER E.O. 2-11656	BLM	4/4/85	J.Crabtree

NOTES: UNLESS OTHERWISE SPECIFIED.

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003 .
2. RESISTANCE IN OHMS .
3. CAPACITANCE IN MICROFARADS .
4. (4) RUBBER STAMP ASSEMBLY NUMBER AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON SOLDER SIDE .
5. TRIM ALL COMPONENT LEADS TO .062 MAX.
6. FOR MATERIAL LIST SEE SHEETS 2 THRU 4 .



HOLE TOLERANCES	NOTES UNLESS SPECIFIED			
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.03 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	S. DUONG	3-26-85
		CHECK	B.L.M. B.E.S.	4-2-85
		APPR.	J. CRABTREE	4-2-85
SUPERSEDES		MATERIAL		
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DORIC — DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO, CA 92123

TITLE: ASSEMBLY, PCB CURRENT INPUT

SIZE	CODE IDENT. NO.	DRAWING NO.	CHANGE LETTER
C		605-4370-00	B

SCALE 2:1 | DO NOT SCALE DRAWING | SHEET 1 OF 4

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE		4-2-85	J Gaither
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600		8/30/85	J Gaither
	B	PRODUCTION RELEASE PER E.O. 2-11656		12/18/85	J Gaither

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED			
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°	DRAWN	S. DUONG	3/27/85
2. BREAK ALL SHARP EDGES .010 APPROX.	CHECK		4-2-85
3. MACH. SURFACES √	APPR.	J Gaither	4/2/85
4. ALL DIM. IN INCHES	MATERIAL		
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSEMBLY, PCB, CURRENT INPUT

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4370-00	B
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 4

MDE 11-79 001 DORIC

Part No: 600CUR
Revision:

PARTS LIST
DORIC ASSEMBLY, PCB CURRENT INPUT 605-4370-00 B

27-MAR-85

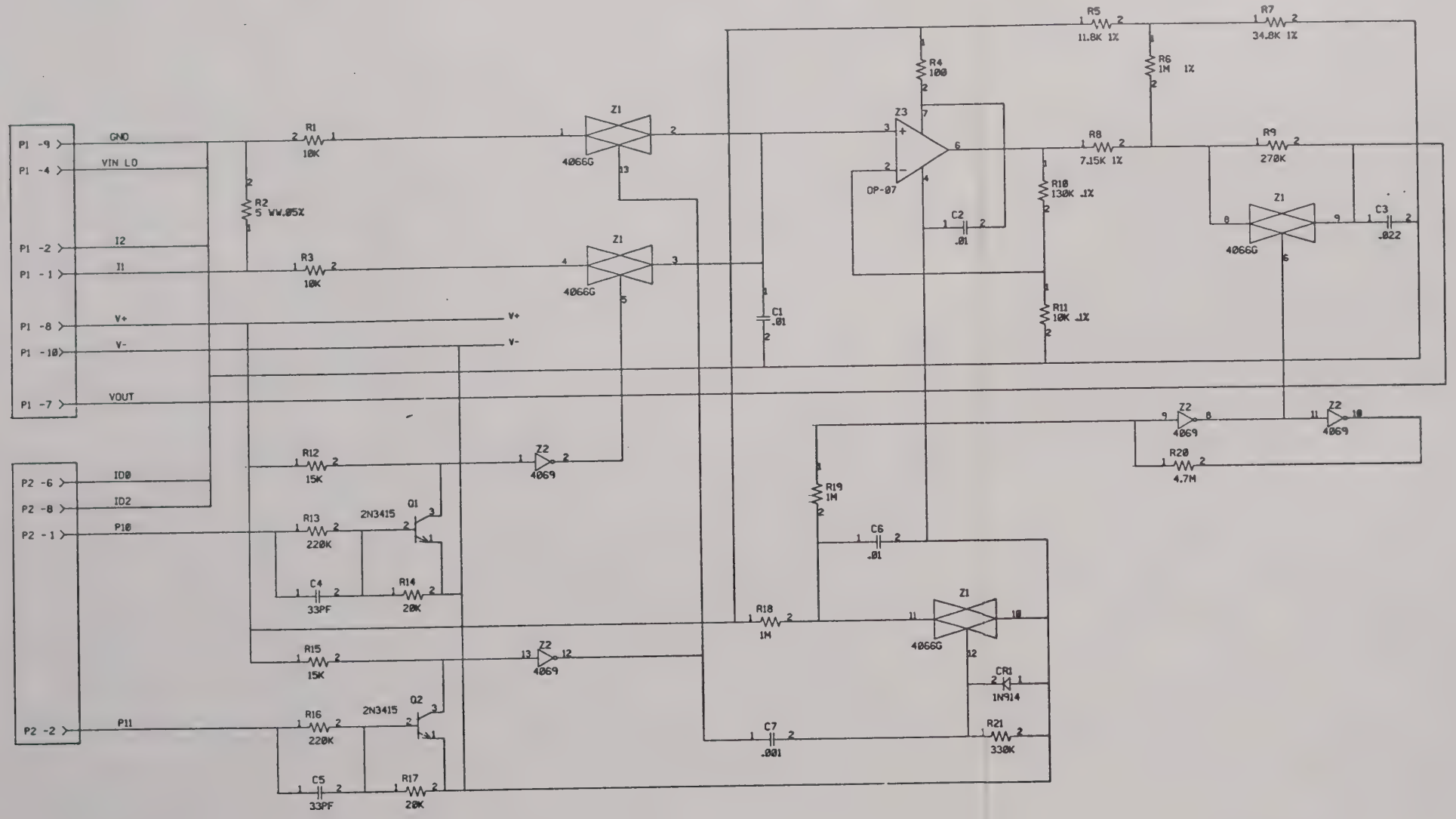
Item No.	Qtw Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	IC, GRADED 4066	4066G	Z1	000-8130-00	
2	1	IC, DIG, HEX INVERTING BUFFER	4069	Z2	965-587-05	
3	3	CAP AXIAL .01 @ 50V	900-021-07	C1,C2,C6	900-021-07	
4	1	CAP AXIAL .001 @ 50V	900-021-09	C7	900-021-09	
5	2	CAP DISC 33PF @ 1KV	901-013-30	C4,C5	901-013-30	
6	1	CAP POLYPROP .022 @ 200V 10%	918-0022-20	C3	918-0022-20	
7	2	RES MF RN55C 1.0% 10.0K	924-4100-02	R1,R3	924-4100-02	
8	1	RES MF RN55C 1.0% 1.00M	924-4100-04	R6	924-4100-04	
9	1	RES MF RN55C 0.1% 10.0K	924-4100-09	R11	924-4100-09	
10	1	RES MF RN55C 1.0% 11.8K	924-4118-02	R5	924-4118-02	
11	1	RES MF RN55C 0.1% 130K	924-4130-03	R10	924-4130-03	
12	1	RES MF RN55C 1.0% 34.8K	924-4348-02	R7	924-4348-02	
13	1	RES MF RN55C 1.0% 7.15K	924-4715-01	R8	924-4715-01	
14	1	RES WW J115 10PPM .05% 5.0 OHM	937-201-16	R2	937-201-16	
15	1	RES CBN 1/4W 5% 100 OHM	942-201-01	R4	942-201-01	
16	2	RES CBN 1/4W 5% 1M	942-201-05	R18,R19	942-201-05	
17	2	RES CBN 1/4W 5% 15K	942-201-53	R12,R15	942-201-53	
18	2	RES CBN 1/4W 5% 20K	942-202-03	R14,R17	942-202-03	
19	2	RES CBN 1/4W 5% 220K	942-202-24	R13,R16	942-202-24	
20	1	RES CBN 1/4W 5% 270K	942-2027-04	R9	942-2027-04	
21	1	RES CBN 1/4W 5% 330K	942-203-34	R21	942-203-34	
22	1	RES CBN 1/4W 5% 4.7M	942-204-75	R20	942-204-75	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
23	1	DIODE 1N914 (1N4148)	961-091-40	CR1	961-091-40	
24	2	XSTR 2N3415 NPN	962-341-50	Q1,Q2	962-341-50	
25	1	IC OP-07 PREC OPAMP	965-607-00	Z3	965-607-00	
26	2	CONN., 10 PIN HEADER	973-3500-25	P1,P2	973-3500-25	
27	1	PCB, CURRENT INPUT BOARD	605-2370-00		605-2370-00	
28	1	SCHEM, CURRENT INPUT BOARD	605-6370-00		605-6370-00	

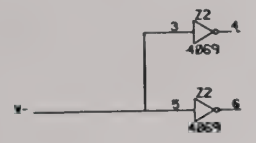
NOTES: UNLESS OTHERWISE SPECIFIED.

1. RESISTOR VALUES ARE IN OHMS,1/4W,5% .
2. CAPACITOR VALUES ARE IN MICROFARADS.

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		A2	R & D RELEASE	[illegible]	[illegible]	[illegible]
		A1	LTD USAGE REL PER ECO-11630	[illegible]	[illegible]	[illegible]
		B	PROD REL PER E.O. 2-11656	[illegible]	[illegible]	[illegible]



UNUSED GATES



REFERENCE DESIGNATORS		
REF DES	LAST USED	DO NOT USE
RESISTOR	R21	
CAPACITOR	C7	
TRANSISTOR	Q2	
DIODE	CR1	
IC	Z3	
CONNECTOR	P2	

I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	4066G	14	V+	7	V-
Z2	4069	14	V+	7	V-
Z3	OP-07	SEE SCHEMATIC			

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ASSY.NO. 605-4370-XX

SUPERSEDES

DRAWN	S. DUONG	3-85
CHECK	R.E.G.	6-5-85
DES/ENG	R.E. GRIPPEN	6-5-85
APPR.	J. CRABTREE	6-12-85

DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE SCHEMATIC, CURRENT INPUT

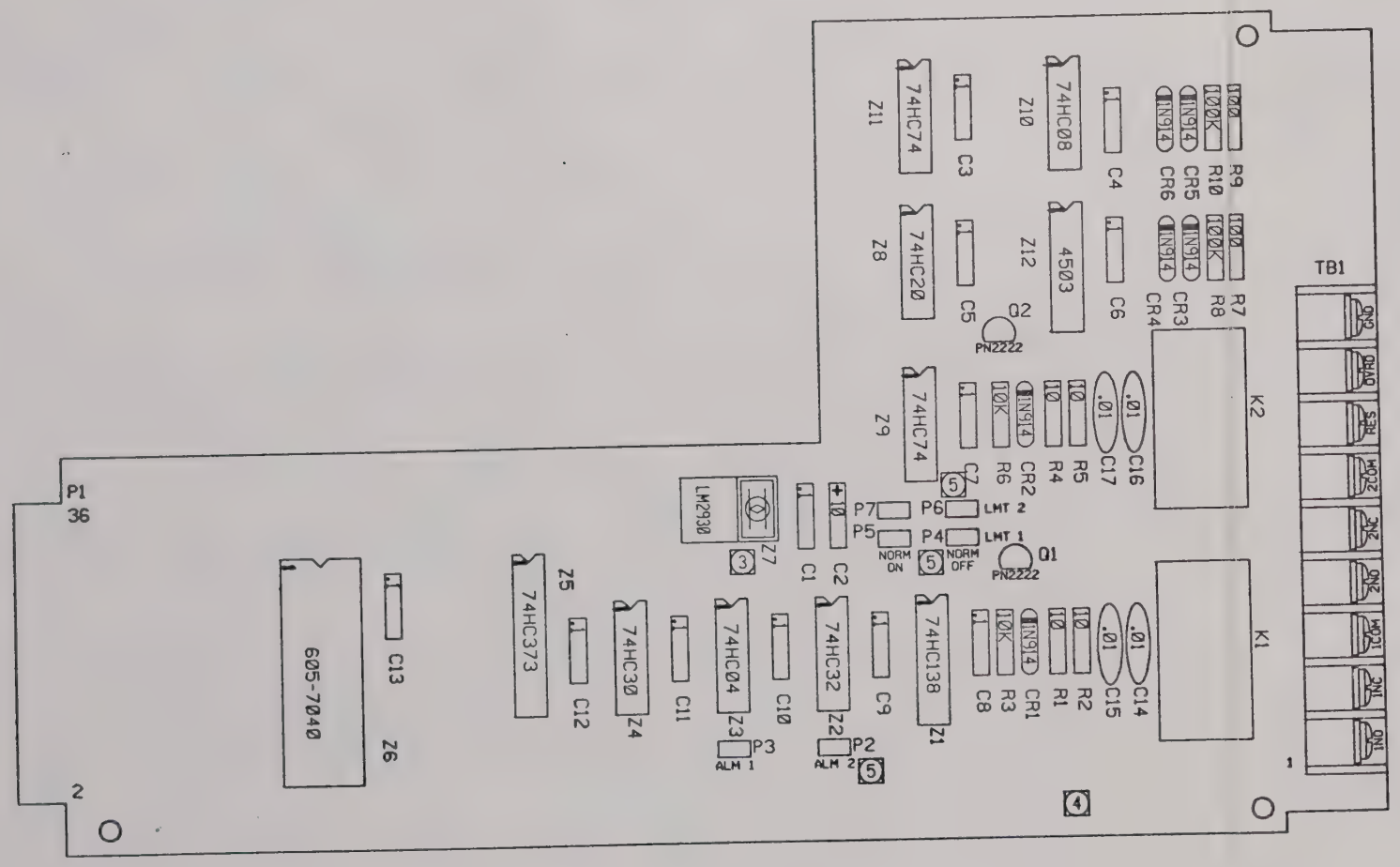
SIZE D | DRAWING NO. 605-6370-00 | CHANGE LETTER B

SCALE — | DO NOT SCALE DRAWING | SHEET 1 OF 1

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		X1	R & D RELEASE	BLM	4-24-85	J.CRABTREE
		A1	LTD USAGE REL PER EO2-11620	DV	8-30-85	J.CRABTREE
		B	PROD REL PER E.O. 2-11656	DV	12-19-85	J.CRABTREE
		C	REVISED PER E.O.2-11692	HL	2-25-86	J.CRABTREE
		D	REVISED PER E.O.2-11770	HL	7-14-86	J.Crabtree
		E	REVISED PER E.O. 2-11807	HL	7-14-86	J.Crabtree

NOTES: UNLESS OTHERWISE SPECIFIED

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. DELETED.
3. INSTALL REGULATOR (ITEM 23) WITH 4-40 SCREW (ITEM 27), AND TINNERMAN FASTENER (ITEM 28), SCREW HEAD TO BE ON FAR (SOLDER) SIDE OF BOARD.
4. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON FAR (SOLDER) SIDE.
5. INSTALL CONN, 2 POS FEMALE JUMPER (ITEM 26), 3 PLACES.
6. FOR MATERIAL LIST, SEE SHEETS 2 THRU 4.



HOLE TOLERANCES	NOTES UNLESS SPECIFIED				
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.03 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .005 APPROX. 3. MACH. SURFACES 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	H. LAM	4-24-85	DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO, CA 92123
SUPERSEDES		CHECK	B.L.M.	5-1-85	TITLE: ASSEMBLY, PCB, ALARM BOARD
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REVISIONS

LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	[illegible]	5-1-85	J Crathree
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	DV.	8/30/85	J Crathree
	B	PRODUCTION RELEASE PER E.O. 2-11656	dv	12/18/85	J Crathree
	C	REVISED PER E.O. 2-11692	HL	1/16/86	J Crathree
	D	REVISED PER E.O. 2-11770	HL	4/29/86	J Crathree
	E	REVISED PER E.O. 2-11807	HL	7/28/86	J Crathree

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED

1. TOLERANCES .xx ± .03 DIMENSIONED .xxx ± .010 ANGLES ± ½°
2. BREAK ALL SHARP EDGES .010 APPROX.
3. MACH. SURFACES √
4. ALL DIM. IN INCHES
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC

DRAWN	H. LAM	4-25-85
CHECK	[illegible]	5-1-85
APPR.	J Crathree	5/6/85

MATERIAL

DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

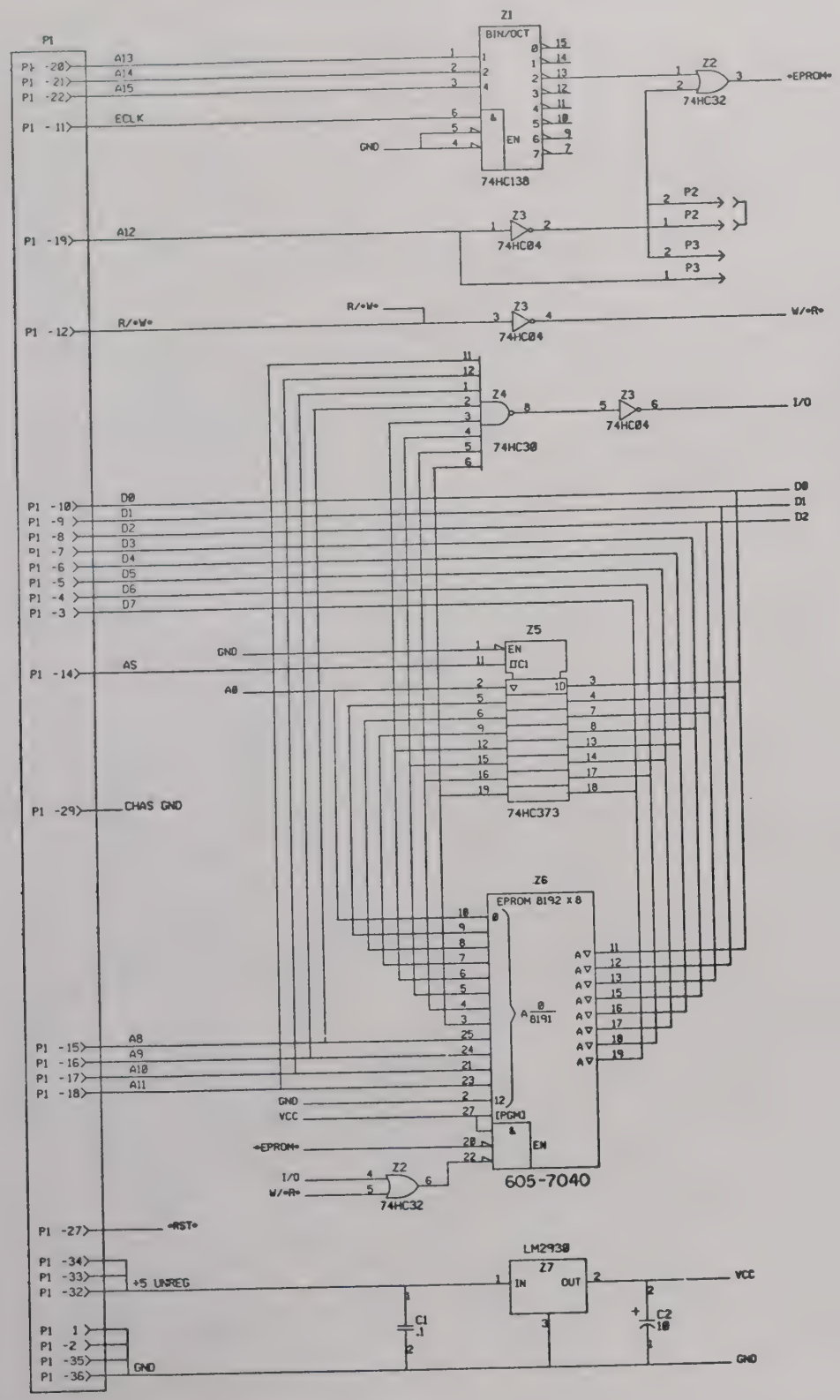
TITLE:

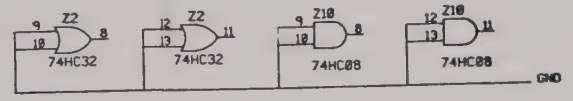
ASSY, PCB, ALARM BOARD

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4440-00	E
NEXT ASSY. 605-802X-XX		SCALE:	SHEET 2 OF 4	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	600 MEMORY, 2764 ALARM OPTION	605-7040-01	Z6	605-7040-01	
2	1	IC, DIG, HEX NON-INVERTING TRI-ST BUFFER	4503	Z12	965-587-69	
3	1	IC, DIG, HEX INVERTER	74HC04	Z3	965-6351-05	
4	1	IC, DIG, QUAD 2-INPUT AND	74HC08	Z10	965-6351-06	
5	1	IC, DIG, 3-TO-8 LINE DECODER	74HC138	Z1	965-6351-11	
6	1	IC, DIG, DUAL 4-INPUT NAND GATE	74HC20	Z8	965-6351-26	
7	1	IC, DIG, 8-INPUT NAND GATE	74HC30	Z4	965-6351-27	
8	1	IC, DIG, QUAD 2-INPUT OR	74HC32	Z2	965-6351-28	
9	1	IC, DIG, OCTAL D-LATCH TRI-STATE OUTPUTS	74HC373	Z5	965-6351-02	
10	2	IC, DIG, DUAL D FLIP-FLOP	74HC74	Z11,Z9	965-6351-08	
11	4	CAP DISC .01 @ 500V	900-021-04	C14,C15,C16,C17	900-021-04	
12	12	CAP AXIAL .1 @ 50V	900-021-08	C1,C10,C11,C12,C13,C3,C4,C5,C6,C7,C8, C9	900-021-08	
13	1	CAP TANT AXIAL 10 @ 10V (162D)	916-010-10	C2	916-010-10	
14	4	RES CBN 1/4W 5% 10 OHM	942-201-00	R1,R2,R4,R5	942-201-00	
15	2	RES CBN 1/4W 5% 100 OHM	942-201-01	R7,R9	942-201-01	
16	2	RES CBN 1/4W 5% 10K	942-201-03	R3,R6	942-201-03	
17	2	RES CBN 1/4W 5% 100K	942-201-04	R10,R8	942-201-04	
18	6	DIODE 1N914 (1N4148)	961-091-40	CR1,CR2,CR3,CR4,CR5,CR6	961-091-40	
19	2	XSTR PN2222	962-222-20	Q1,Q2	962-222-20	
20	2	RELAY SPDT 5VDC COIL	970-011-01	K1,K2	970-011-01	
21	1	TERM STRIP 9 POS	973-0103-01	TB1	973-0103-01	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
22	6	CONN 2 PIN HEADER .1 L.S.	973-3700-23	P2,P3,P4,P5,P6,P7	973-3700-23	
23	1	IC, REGULATOR +5V	LM2930	Z7	965-5010-12	
24	1	PCB, ALARM BOARD	605-2440-00		605-2440-00	
25	1	SCHEMATIC, ALARM BOARD	605-6440-00		605-6440-00	
26	3	CONN, 2 POSITION FEMALE JUMPER	991-0100-50	(P3, P4, P6)	991-0100-50	
27	1	SCREW, PAN HD PHILLIPS, 4-40 X 1/4 LG	980-440-025	(Z7)	980-440-025	
28	1	FASTENERS, TINNERMAN 4-40	991-0201-14	(Z7)	991-0201-14	





NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
2. CAPACITOR VALUES ARE IN MICROFARADS.

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		A	[illegible]	[illegible]	[illegible]	[illegible]
		B	PROD REL PER E.O. 2-11656	[illegible]	[illegible]	[illegible]

I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	74HC138	16	VCC	8	GND
Z2	74HC32	14	VCC	7	GND
Z3	74HC04	14	VCC	7	GND
Z4	74HC30	14	VCC	7	GND
Z5	74HC373	20	VCC	10	GND
Z6	605-7040	28	VCC	14	GND
		1	VCC	26	VCC
Z8	74HC20	14	VCC	7	GND
Z9	74HC74	14	VCC	7	GND
Z10	74HC08	14	VCC	7	GND
Z11	74HC74	14	VCC	7	GND
Z12	4503	16	VCC	8	GND

REFERENCE DESIGNATORS		
REF DESG.	LAST USED	NOT USED
RESISTOR	R10	
CAPACITOR	C17	
DIODE	CR6	
TRANSISTOR	Q2	
I.C.	Z12	
CONN	P7	
RELAY	K2	
TERM. BLOCK	TB1	

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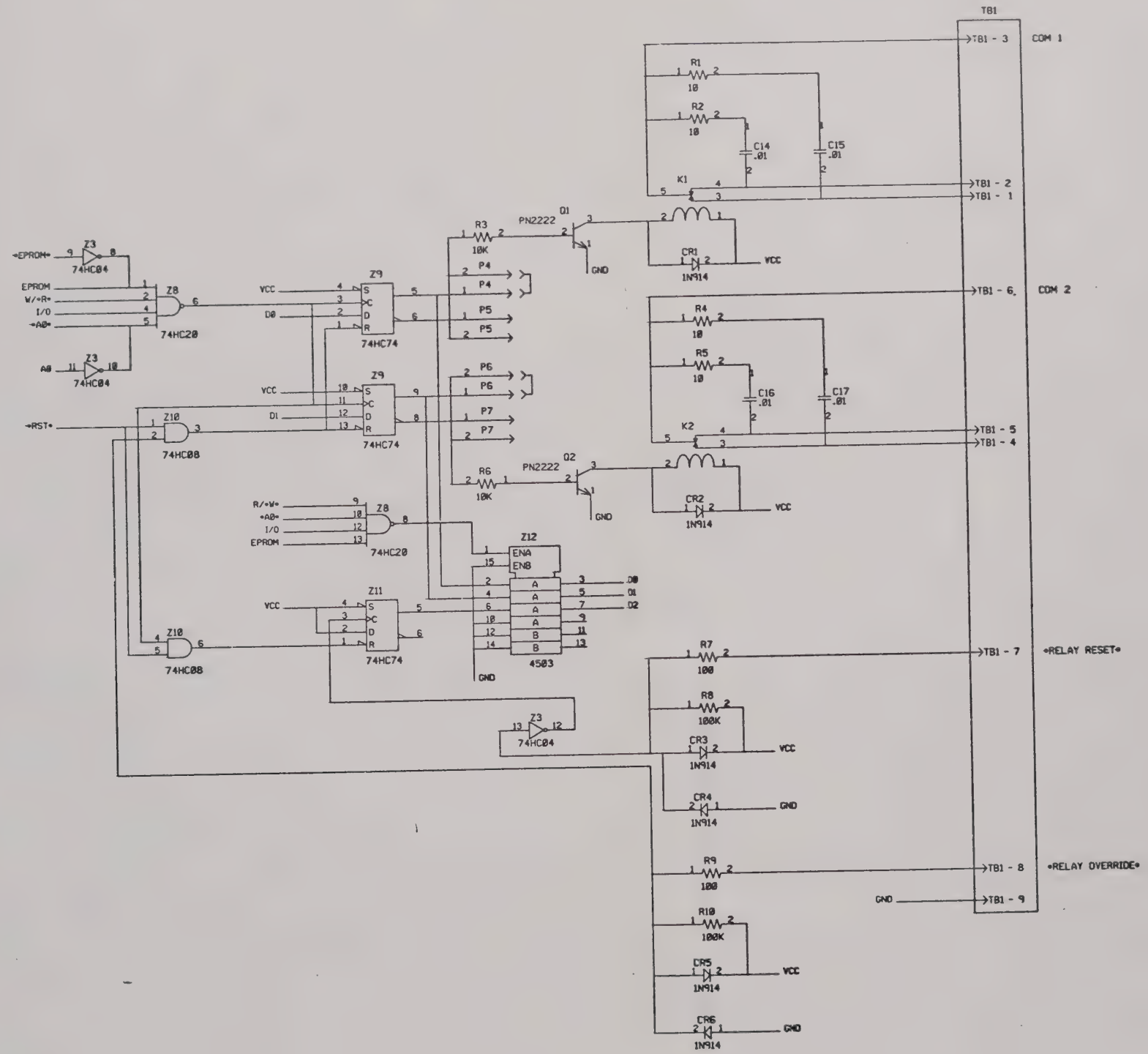
ASSY.NO. 605-4440-XX	SUPERSEDES		
DRAWN	H. LAM	4-12-85	
CHECK	R.E.G.	5-22-85	
DES/ENG	R.E.GRIPPEN	6-4-85	
APPR.	J. CRABTREE	6-4-85	

DORIC — DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, ALARM BOARD

SIZE	DRAWING NO.	CHANGE LETTER
D	605-6440-00	B

SCALE — | DO NOT SCALE DRAWING | SHEET 1 OF 2

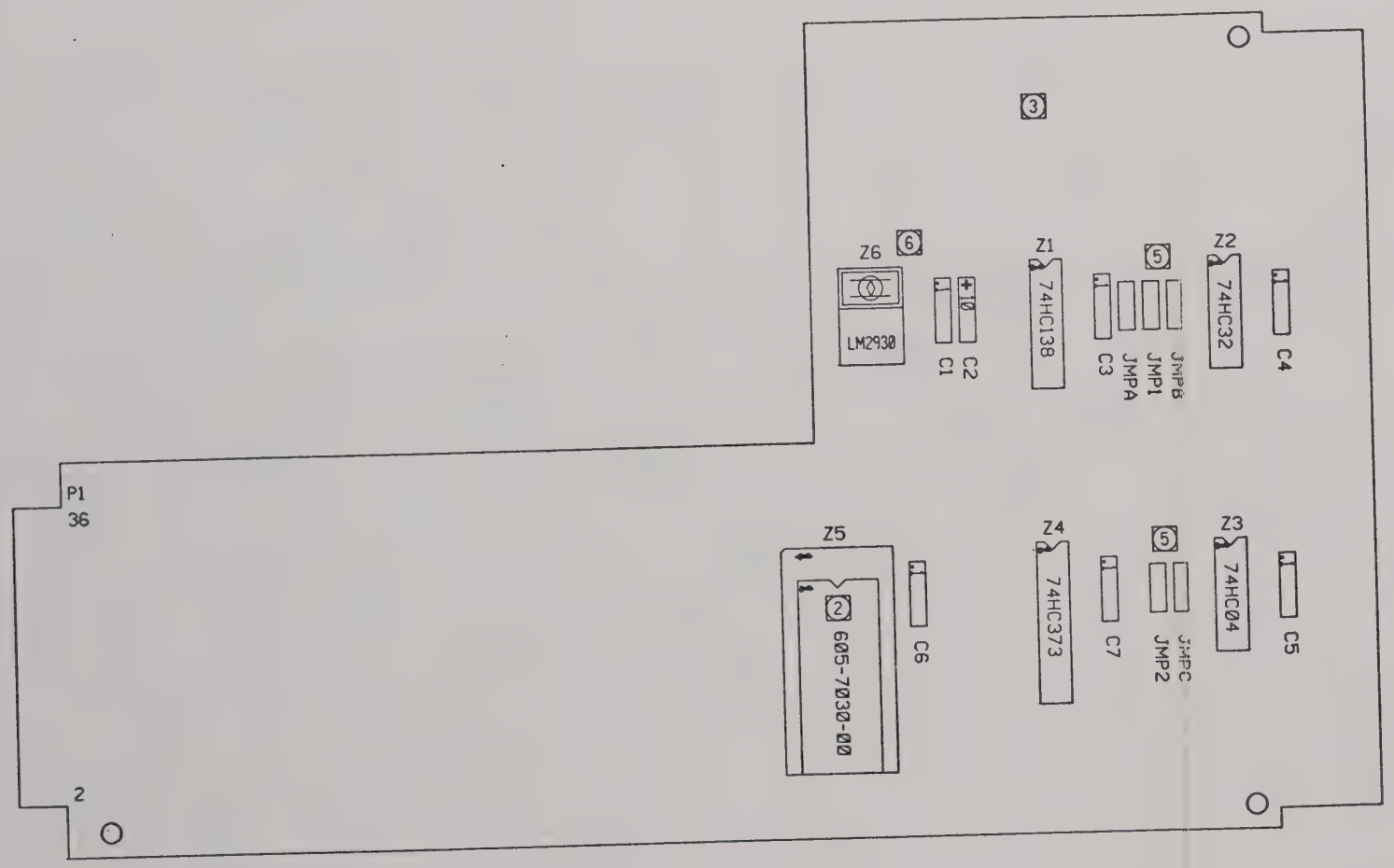


SIZE	CODE IDENT NO.	DRAWING NO.	CHANGE LETTER
D		605-6440-00	B
SCALE ——	DO NOT SCALE DRAWING	SHEET 2 OF 2	

ZONE	LAL	REV	DESCRIPTION	CHECKED	APPROVED
		A	[illegible]	[illegible]	[illegible]
		B	PROD REL PER E.O. [illegible]	[illegible]	[illegible]

NOTES: UNLESS OTHERWISE SPECIFIED

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. INSTALL 28 PIN I.C. SOCKET, (ITEM 10), 1 PLACE. INSTALL I.C. Z5 INTO SOCKET.
3. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON FAR (SOLDER) SIDE.
4. FOR MATERIAL LIST, SEE SHEETS 2 AND 3.
5. INSTALL JUMPERS JMP1 AND JMP2 ONLY.
6. INSTALL REGULATOR (ITEM 9) WITH 4-40 SCREW (ITEM 13), AND TINNERMAN FASTENER (ITEM 14). SCREW HEAD TO BE ON FAR (SOLDER) SIDE OF BOARD.



HOLE TOLERANCES	NOTES UNLESS SPECIFIED				
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.006 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .X ±.03 DIMENSIONED ANGLES .XX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	H.LAM	4-02-85	DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO, CA 92123
SUPERSEDES		CHECK	R.E.D. B.L.M.	4-8-85	TITLE: ASSEMBLY, PCB, SCALE OPTION
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8 7 6 5 4 3 2 1

D C B A

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	[illegible]	4-8-85	[signature]
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	DV.	8/30/85	[signature]
	B	PRODUCTION RELEASE PER E.O. 2-11656	[signature]	12/10/85	[signature]

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED	DRAWN	H. LAM	4/3/85
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°	CHECK	[signature]	4-8-85
2. BREAK ALL SHARP EDGES .010 APPROX.	APPR.	[signature]	4/11/85
3. MACH. SURFACES √	MATERIAL		
4. ALL DIM. IN INCHES			
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSEMBLY, PCB, SCALE OPTION

USED ON 600/700	FINISH	SIZE A	DWG NO. 605-4450-00
NEXT ASSY. 605-802X-XX		SCALE:	SHEET 2 OF 3

CHANGE LETTER B

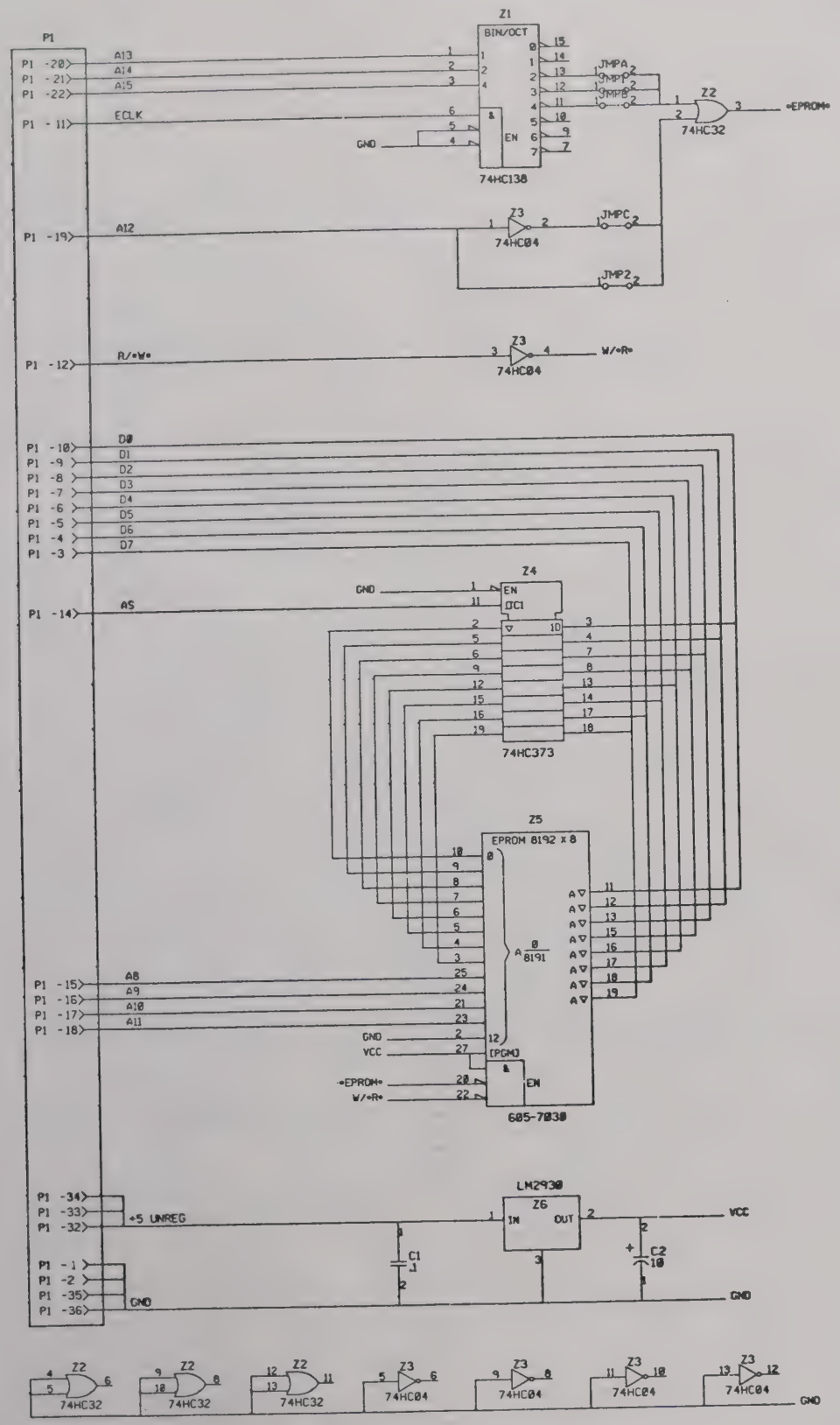
Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	600 MEMORY, SCALE OPTION	605-7030-00	Z5	605-7030-00	
2	1	IC, DIG, HEX INVERTER	74HC04	Z3	965-6351-05	
3	1	IC, DIG, 3-TO-8 LINE DECODER	74HC138	Z1	965-6351-11	
4	1	IC, DIG, QUAD 2-INPUT OR	74HC32	Z2	965-6351-28	
5	1	IC, DIG, OCTAL D-LATCH TRI-STATE OUTPUTS	74HC373	Z4	965-6351-02	
6	6	CAP AXIAL .1 @ 50V	900-021-08	C1,C3,C4,C5,C6,C7	900-021-08	
7	1	CAP TANT AXIAL 10 @ 10V (162D)	916-010-10	C2	916-010-10	
8	2	JUMPER .5" 22AWG	991-010-05	JMP1,JMP2	991-010-05	
9	1	IC, REGULATOR +5V	LM2930	Z6	965-5510-12	
10	1	SOCKET I.C., 28 PIN	992-010-85	(Z5)	992-010-85	
11	1	PCB, EPROM BOARD	605-2450-00		605-2450-00	
12	1	SCHEM, SCALE OPTION	605-6450-00		605-6450-00	
13	1	SCREW, PAN HD PHILLIPS, 4-40 X 1/4 LG		(Z6)	980-440-025	
14	1	FASTERNER, TINNERMAN, 4-40		(Z6)	991-0201-14	

8	7	6	5	4	3	2	1

NOTES: UNLESS OTHERWISE SPECIFIED

1. CAPACITOR VALUES ARE IN MICROFARADS.

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		1	[illegible]	[illegible]	[illegible]	J. CRABTREE
		5	PROD REL PER E.O. 2-1196	[illegible]	[illegible]	[illegible]



I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	74HC138	16	VCC	8	GND
Z2	74HC32	14	VCC	7	GND
Z3	74HC04	14	VCC	7	GND
Z4	74HC373	20	VCC	10	GND
Z5	605-7030	28	VCC	14	GND
		1	VCC	26	VCC

REFERENCE DESIGNATORS		
REF DESG.	LAST USED	NOT USED
CAPACITOR	C7	
I.C.	Z6	
JUMPER	JMP2	
CONN	P1	

ASSY.NO. 605-4450-XX	SUPERSEDES		
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	CHECK	R.E.G.	4-8-85
	DES/ENG	R.E. GRIPPEN	4-8-85
	APPR.	J. CRABTREE	4-11-85

DORIC — DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, SCALE OPTION

SIZE: D | DRAWING NO.: 605-6450-00 | CHANGE LETTER: B

SCALE — | DO NOT SCALE DRAWING | SHEET 1 OF 1

8	7	6	5	4	3	2	1

ZONE	LAL	REV	DESCRIPTION	CHECK	APPROVED
		A1	LTD USAGE REL PER ECO-11603		
		B	PROD REL PER E.N. 2-11656		
		C	REVISED PER E.O. 2-11807		

NOTES: UNLESS OTHERWISE SPECIFIED

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.

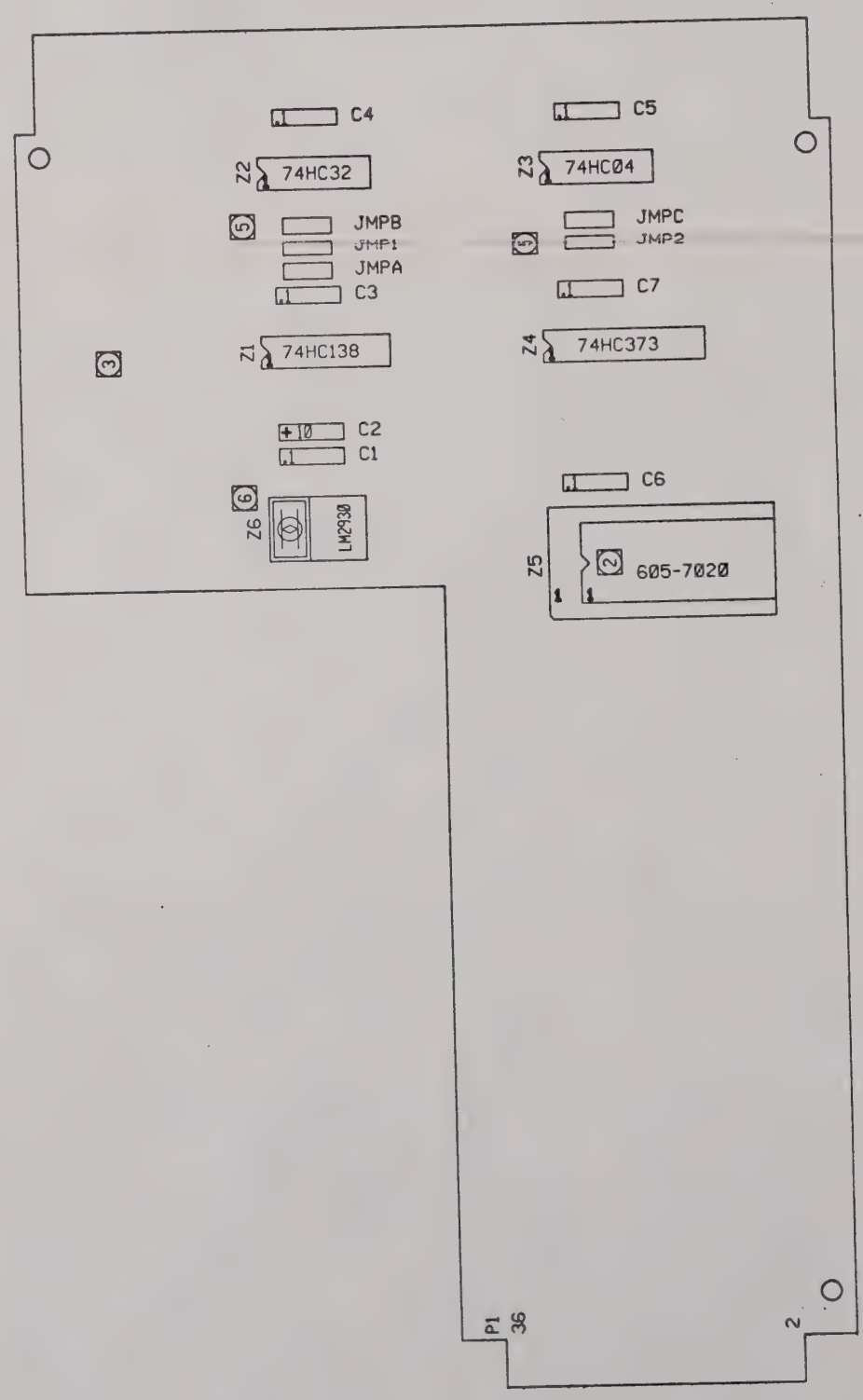
(2) INSTALL 28 PIN I.C. SOCKET, (ITEM 10), 1 PLACE.
INSTALL I.C. 25 INTO SOCKET.

(3) RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON FAR (SOLDER) SIDE.

4. FOR MATERIAL LIST, SEE SHEETS 2 AND 3.

(5) INSTALL JUMPERS JMPB AND JMP2 ONLY.

(6) INSTALL REGULATOR (ITEM 10) WITH 4-40 SCREW (ITEM 13), AND TINNERMAN FASTENER (ITEM 14), SCREW HEAD TO BE ON FAR (SOLDER) SIDE OF BOARD.



HOLE TOLERANCES

.000 - .254 DIA +.004 -.002
.251 - .500 DIA +.005 -.002
.501 - 1.00 DIA +.010 -.005

SUPERSEDES

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NOTES UNLESS SPECIFIED

1. TOLERANCES
.XX ± .03 DIMENSIONED ANGLES ± 1/2°
.XXX ± .010
2. BREAK ALL SHARP EDGES .010 APPROX.
3. FINISH SURFACES
4. ALL DRILLING INCHES
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC

USED ON 600/7000

NEXT ASSY. 605-802X-XX

DRAWN L. OFTEDAHL 8-86-85
CHECK
APPR.
MATERIAL

FINISH

DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO, CA 92123

TITLE
ASSEMBLY, PCB, MATH OPTION

SIZE D | CODE IDENT. NO. | DRAWING NO. 605-4460-00 | CHANGE LETTER C

SCALE 1:1 | DO NOT SCALE DRAWING | SHEET 1 OF 3

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	DV.	8/30/85	
	B	PRODUCTION RELEASE PER E.O. 2-11656	DV.	12/18/85	
	C	REVISED PER E.O. 2-11807	HL	7/28/86	

NOTES: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED			
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°	DRAWN	L.OFTEDAHL	8/7/85
2. BREAK ALL SHARP EDGES .010 APPROX.	CHECK	Don Vilbrandt	8/30/85
3. MACH. SURFACES √	APPR.		8/30/85
4. ALL DIM. IN INCHES	MATERIAL		
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSEMBLY, PCB, MATH OPTION

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4460-00	C
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 3

Part No: 600EPM
Revision:

PARTS LIST

DORIC - PCB ASSY, MATH OPTION 605-4460-00 C

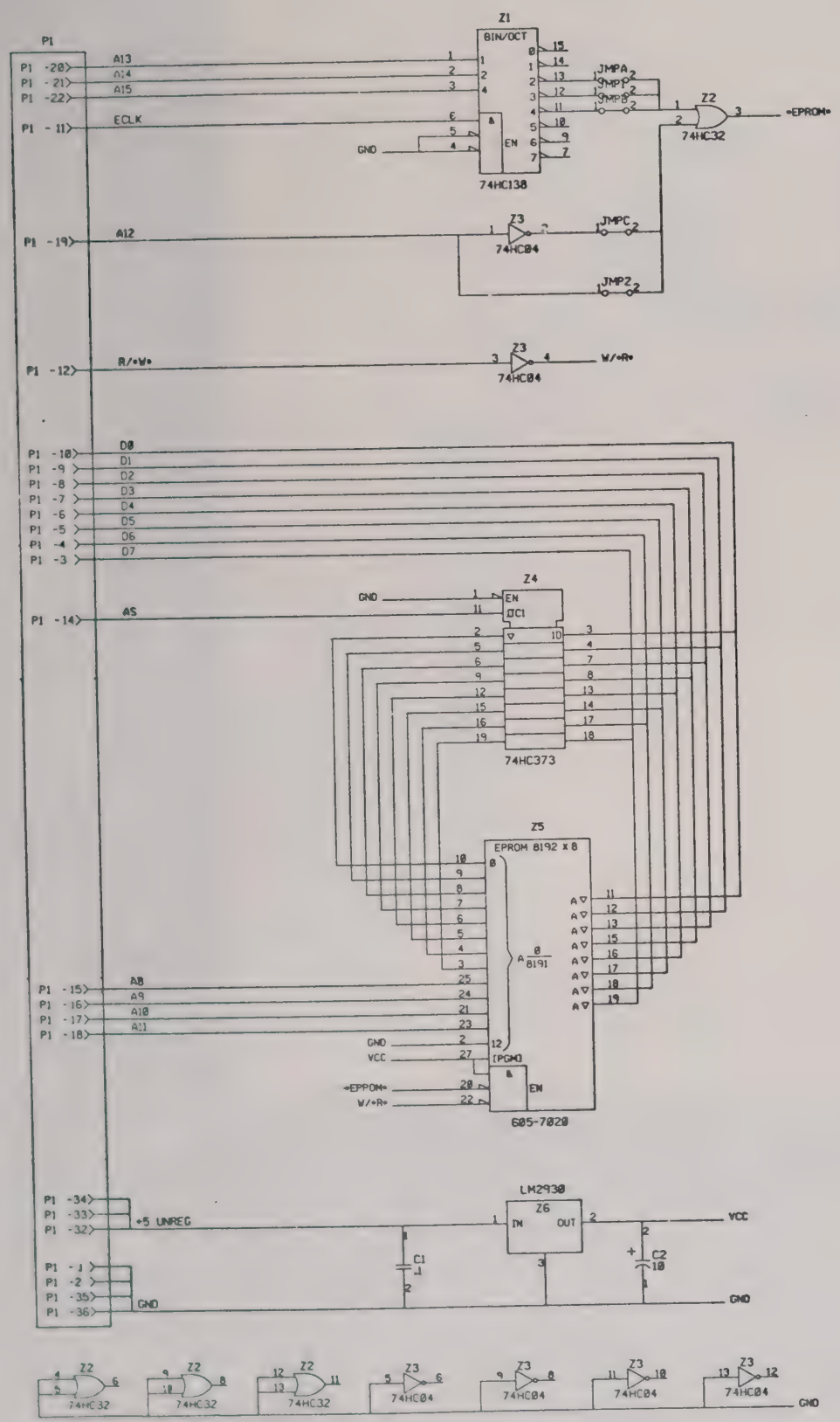
6-AUG-85

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	600 MEMORY, MATH OPTION	605-7020-01	Z5	605-7020-01	
2	1	IC, DIG, HEX INVERTER	74HC04	Z3	965-6351-05	
3	1	IC, DIG, 3-TO-8 LINE DECODER	74HC138	Z1	965-6351-11	
4	1	IC, DIG, QUAD 2-INPUT OR	74HC32	Z2	965-6351-28	
5	1	IC, DIG, OCT D-LATCH TRI-ST OUTPUTS	74HC373	Z4	965-6351-02	
6	6	CAP AXIAL .1 @ 50V	900-021-08	C1,C3,C4,C5,C6,C7	900-021-08	
7	1	CAP TANT AXIAL 10 @ 10V (162D)	916-010-10	C2	916-010-10	
8	2	JUMPER .5" 22AWG	991-010-05	JMP2,JMPB	991-010-05	
9	1	IC SOCKET, 28 PIN	992-010-85	(Z5)	992-010-85	
10	1	REGULATOR POS 5V	LM2930	Z6	965-5510-12	
11	1	PCB, EPROM BOARD	605-2450-00		605-2450-00	
12	1	SCHEM, MATH OPTION	605-6460-00		605-6460-00	
13	1	SCREW, PAN HD PHILLIPS, 4-40 X 1/4 LG		(Z6)	980-440-025	
14	1	FASTENER, TINNERMAN, 4-40		(Z6)	991-0201-14	

REVISIONS					
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		A1	LTO USAGE REL PER ECO-11630			
		B	PROD REL PER E.O. 2-11656			

NOTES: UNLESS OTHERWISE SPECIFIED

1. CAPACITOR VALUES ARE IN MICROFARADS.



I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	74HC138	16	VCC	8	GND
Z2	74HC32	14	VCC	7	GND
Z3	74HC04	14	VCC	7	GND
Z4	74HC373	20	VCC	10	GND
Z5	605-7020	28	VCC	14	GND
		1	VCC	26	VCC

REFERENCE DESIGNATORS		
REF DESG.	LAST USED	NOT USED
CAPACITOR	C7	
I.C.	Z6	
JUMPER	JMP2	
CONN	P1	

ASSY.NO. 605-4460-XX	SUPERSEDES		
	DRAWN	L. OFTEDAHL	8-6-85
	CHECK		
	DES/ENG		
	APPR.		

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DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, MATH OPTION

SIZE D | DRAWING NO. 605-6460-00 | CHANGE LETTER B

SCALE — | DO NOT SCALE DRAWING | SHEET 1 OF 1

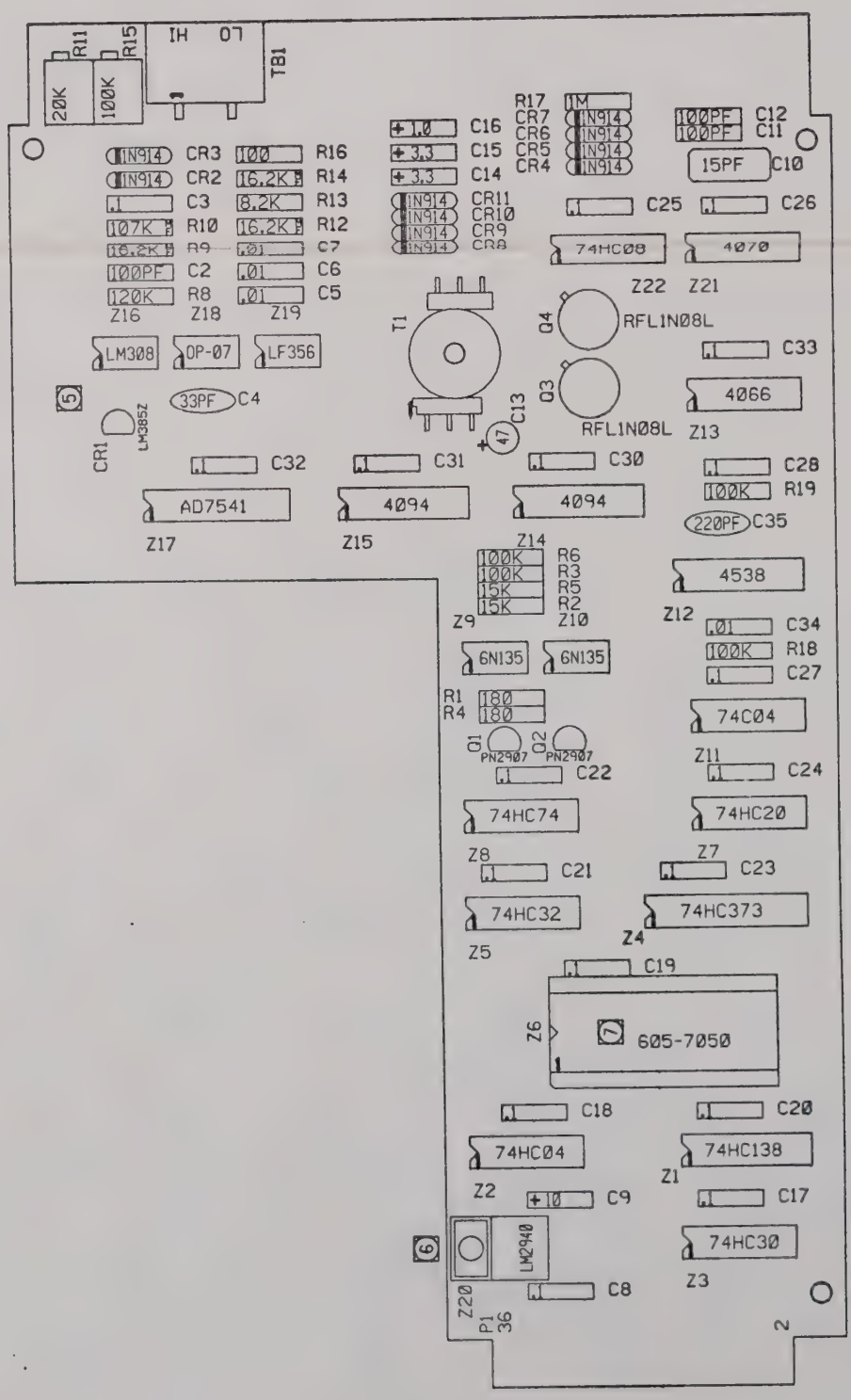
0-10V

ZONE	LAL	REV	DESCRIPTION	ENG	DATE	APPROVED
		X1	[illegible]	[illegible]	[illegible]	BLM_DOC
		A1	[illegible]	[illegible]	[illegible]	[illegible]
		A2	REVISED PER E.O. 2-11654	REG	[illegible]	J. CRABTREE
		B	PROD. REL. PER E.O. 2-11656	DV	[illegible]	J. CRABTREE
		C	REVISED PER E.O. 2-11750	[illegible]	[illegible]	[illegible]
		D	REVISED PER E.O. 2-11807	[illegible]	[illegible]	[illegible]

NOTES: UNLESS OTHERWISE SPECIFIED

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. RESISTANCE IS IN OHMS.
3. CAPACITANCE IS IN MICROFARADS.
4. FOR MATERIAL LIST, SEE SHEETS 2 THRU 5.
5. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON FAR (SOLDER) SIDE.

6. INSTALL REGULATOR (ITEM 39) WITH SCREW (ITEM 48), AND TINNERMAN FASTENER (ITEM 49). SCREW HEAD TO BE ON FAR (SOLDER) SIDE OF BOARD.
7. INSTALL IC SOCKET (ITEM 50), INSTALL IC Z6 INTO SOCKET.



HOLE TOLERANCES	NOTES UNLESS SPECIFIED				
.0938 - .250 DIA +.004 -.002 .251 - .500 DIA +.005 -.002 .501 - 1.000 DIA +.010 -.005	1. TOLERANCES UNLESS DIMENSIONED ANGLES ±1° .XX ±.03 .XXX ±.010 2. BREAK ALL SHARP EDGES .XXX APPROVAL 3. FINISH SURFACES 4. ALL DIM IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY AT MMC	DRAWN	L. OFTEDAHL	05-31-85	
		CHECK	L. OFTEDAHL	06-13-85	
		APPR.	J. CRABTREE	06-13-85	
		MATERIAL			
SUPERSEDES		FINISH			
USED ON 600/700					
NEXT ASSY. 605-802X-XX					

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DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO, CA 92123

TITLE

ASSEMBLY, PCB, ANALOG OUTPUT 0-10V

SIZE	CODE IDENT. NO.	DRAWING NO.	CHANGE LETTER
		605-4470-00	D
SCALE 2:1	DO NOT SCALE DRAWING		SHEET 1 OF 5

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	[illegible]	6/13/85	[illegible]
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	D.V	8/30/85	[illegible]
	A2	REVISED PER E.O. 2-11654	RE PI	11/11/85	[illegible]
	B	PRODUCTION RELEASE PER E.O. 2-11656	DV	12/18/85	[illegible]
	C	REVISED PER E.O. 2-11750	AZ	5/7/86	[illegible]
	D	REVISED PER E.O. 2-11807	AZ	7/28/86	[illegible]

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED			
1. TOLERANCES .xx ±.03 DIMENSIONED .xxx ±.010 ANGLES ±½°	DRAWN	L.OFTEDAHL	6/7/85
2. BREAK ALL SHARP EDGES .010 APPROX.	CHECK	L.Oftedahl	6/13/85
3. MACH. SURFACES √	APPR.	[illegible]	6/14/85
4. ALL DIM. IN INCHES	MATERIAL		
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSY, PCB, ANALOG OUTPUT 0-10V

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4470-00	D
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 5

Item No.	Qty Reqd	Description / Identification		Reference Designation	Part Number	See Note
1	1	600 MEMORY, 2764, ANALOG OPTION	605-7050-01	Z6	605-7050-01	
2	1	IC, DIG, QUAD ANALOG SWITCH	4066	Z13	965-587-06	
3	1	IC, DIG, QUAD 2-INPUT EXCLUSIVE OR	4070	Z21	965-587-27	
4	2	IC, DIG, 8-STAGE SHIFT/STORE REGISTER	4094	Z14,Z15	965-587-65	
5	1	IC, DIG, DUAL PRECISION ONE-SHOT	4538	Z12	965-587-72	
6	1	IC DIGITAL HEX INVERTER	74C04	Z11	965-587-05	
7	1	IC, DIG, HEX INVERTER	74HC04	Z2	965-6351-05	
8	1	IC, DIG, QUAD 2-INPUT AND	74HC08	Z22	965-6351-06	
9	1	IC, DIG, 3-TO-8 LINE DECODER	74HC138	Z1	965-6351-11	
10	1	IC, DIG, DUAL 4-INPUT NAND GATE	74HC20	Z7	965-6351-26	
11	1	IC, DIG, 8-INPUT NAND GATE	74HC30	Z3	965-6351-27	
12	1	IC, DIG, QUAD 2-INPUT OR	74HC32	Z5	965-6351-28	
13	1	IC, DIG, OCT D-LATCH TRI-ST OUTPUTS	74HC373	Z4	965-6351-02	
14	1	IC, DIG, DUAL D FLIP-FLOP	74HC74	Z8	965-6351-08	
15	1	IC, 12-BIT D TO A CONV	7541	Z17	965-6360-03	
16	4	CAP AXIAL .01 @ 50V	900-021-07	C5,C6,C7,C34	900-021-07	
17	18	CAP AXIAL .1 @ 50V	900-021-08	C17,C18,C19,C20,C21, C22,C23,C24,C25,C26,C27,C28,C3, C30,C31,C32,C33,C8	900-021-08	
18	3	CAP AXIAL 100PF @ 50V	900-021-13	C11,C12,C2	900-021-13	
19	1	CAP DISC 33PF @ 1KV	901-013-30	C4	901-013-30	
20	1	CAP MICA RADIAL 15PF @ 500V DM15	915-031-50	C10	915-031-50	

DORIC - PCB ASSY, ANALOG OUTPUT 0-10V 605-4470-00 D

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
21	1	CAP TANT AXIAL 10 @ 10V (162D)	916-010-10	C9	916-010-10	
22	1	CAP ELECT RADIAL 47 @ 10V	919-1000-06	C13	919-1000-06	
23	1	RES MF RN55E 1.0% 107K	922-4107-02	R10	922-4107-02	
24	3	RES MF RN55E 0.1% 16.2K	922-416-22	R12,R14,R9	922-416-22	
25	1	RES CBN 1/4W 5% 100 OHM	942-201-01	R16	942-201-01	
26	4	RES CBN 1/4W 5% 100K	942-201-04	R3,R6,R18,R19	942-201-04	
27	1	RES CBN 1/4W 5% 1M	942-201-05	R17	942-201-05	
28	1	RES CBN 1/4W 5% 120K	942-201-24	R8	942-201-24	
29	2	RES CBN 1/4W 5% 15K	942-201-53	R2,R5	942-201-53	
30	2	RES CBN 1/4W 5% 180 OHM	942-201-81	R1,R4	942-201-81	
31						
32	1	RES CBN 1/4W 5% 8.2K	942-208-22	R13	942-208-22	
33	1	POT, 20K CERMET M-TURN END ADJ	960-0120-21	R11	960-0120-21	
34	1	POT, 100K CERMET M-TURN END ADJ	960-015-18	R15	960-015-18	
35	10	DIODE 1N914 (1N4148)	961-091-40	CR10,CR11,CR2,CR3,CR4,CR5,CR6,CR7,CR8, CR9	961-091-40	
36	1	DIODE LM385Z VOLT REF 1.235V	961-385-00	CR1	961-385-00	
37	2	XSTR 2N2907	962-290-70	Q1,Q2	962-290-70	
38	2	FET, PWR 1A 80V RFL1N08L	963-1000-07	Q3,Q4	963-1000-07	
39	1	REGULATOR POS 5V LM2940	964-5300-04	Z20	964-5300-04	
40	2	IC, 6N135 OPTO-ISOLATOR	965-570-00	Z10,Z9	965-570-00	
41	1	IC, OP-AMP LM308	965-590-01	Z16	965-590-01	
42	1	IC OP-07 PREC OPAMP	965-607-00	Z18	965-607-00	
43	1	IC LF356N OPAMP 8 PIN DIP	965-616-00	Z19	965-616-00	
44	1	TRANSFORMER, POWER	967-0050-39	T1	967-0050-39	

DORIC - PCB ASSY, ANALOG OUTPUT 0-10V 605-4470-00 D

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
45	1	TERM STRIP 2 POS	973-0103-00	TB1	973-0103-00	
46	1	PCB, ANALOG OUTPUT 0-10V	605-2470-02		605-2470-02	
47	1	SCHEM, ANALOG OUTPUT 0-10V	605-6470-00		605-6470-00	
48	1	SCREW, PAN HD PHILLIPS, 4-40 X 1/4 LG	980-440-025	(Z20)	980-440-025	
49	1	FASTENER, SELF-LOCKING, TINNERMAN	991-0201-14	(Z20)	991-0201-14	
50	1	SOCKET, IC 28 PIN	992-010-85	(Z6)	992-010-85	
51	2	CAP, TANT AXIAL 3.3 @ 25V (162D)	916-033-25	C14,C15	916-033-25	
52	1	CAP, TANT AXIAL 1.0 @ 35V (162D)	916-0010-35	C16	916-0010-35	
53	1	CAP, DISC 220pf @ 1000V	901-012-21	C35	901-012-21	

NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
2. CAPACITOR VALUES ARE IN MICROFARADS.
3. SEE CHART FOR IC PWR AND GND CONNECTIONS.

REVISIONS

ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		A	R & D RELEASE			J.CRABTREE
		B	PROD. REL. PER E.W.O. D1270			

I.C. POWER CONNECTIONS

REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	74HC138	16	+5V	8	DIG GND
Z2	74HC04	14	+5V	7	DIG GND
Z3	74HC30	14	+5V	7	DIG GND
Z4	74HC373	20	+5V	10	DIG GND
Z5	74HC32	14	+5V	7	DIG GND
Z6	605-7050	28	+5V	26	+5V
		1	+5V	14	DIG GND
Z7	74HC20	14	+5V	7	DIG GND
Z8	74HC74	14	+5V	7	DIG GND
Z9	6N135	SEE SCHEMATIC			
Z10	6N135	SEE SCHEMATIC			
Z11	74C04	14	V+	7	ISO GND
Z12	4538	16	V+	8	ISO GND
Z13	4066	14	+5V	7	DIG GND
Z14	4094	16	V+	8	ISO GND
Z15	4094	16	V+	8	ISO GND
Z16	LM308	7	V+	4	V-
Z17	AD7541	16	V+	3	ISO GND
Z18	OP-07	7	V+	4	V-
Z19	LF356	7	V+	4	V-
Z20	LM2940	SEE SCHEMATIC			
Z21	4070	14	+5V	7	DIG GND
Z22	74HC08	14	+5V	7	DIG GND

REFERENCE DESIGNATORS

REF DESIG	LAST USED	NOT USED
INT CKT	Z22	
TRANSISTOR	Q4	
DIODE	CR11	
RESISTOR	R19	R7
CAPACITOR	C35	C1, C29
XFORMER	T1	
TERM BLOCK	TB1	
CONNECTOR	P1	

ASSY.NO. 605-4470-XX

SUPERSEDES

DRAWN	L.OFTEDAHL	4-26-85
CHECK	R.E.G.	6-12-85
DES/ENG	R.E. GRIPPEN	6-12-85
APPR.	J. CRABTREE	6-12-85

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DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO.
3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, ANALOG OUTPUT 0-10V

SIZE: D | DRAWING NO.: 605-6470-00 | CHANGE LETTER: B

SCALE —— | DO NOT SCALE DRAWING | SHEET 1 OF 3

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D		605-6470-00	B

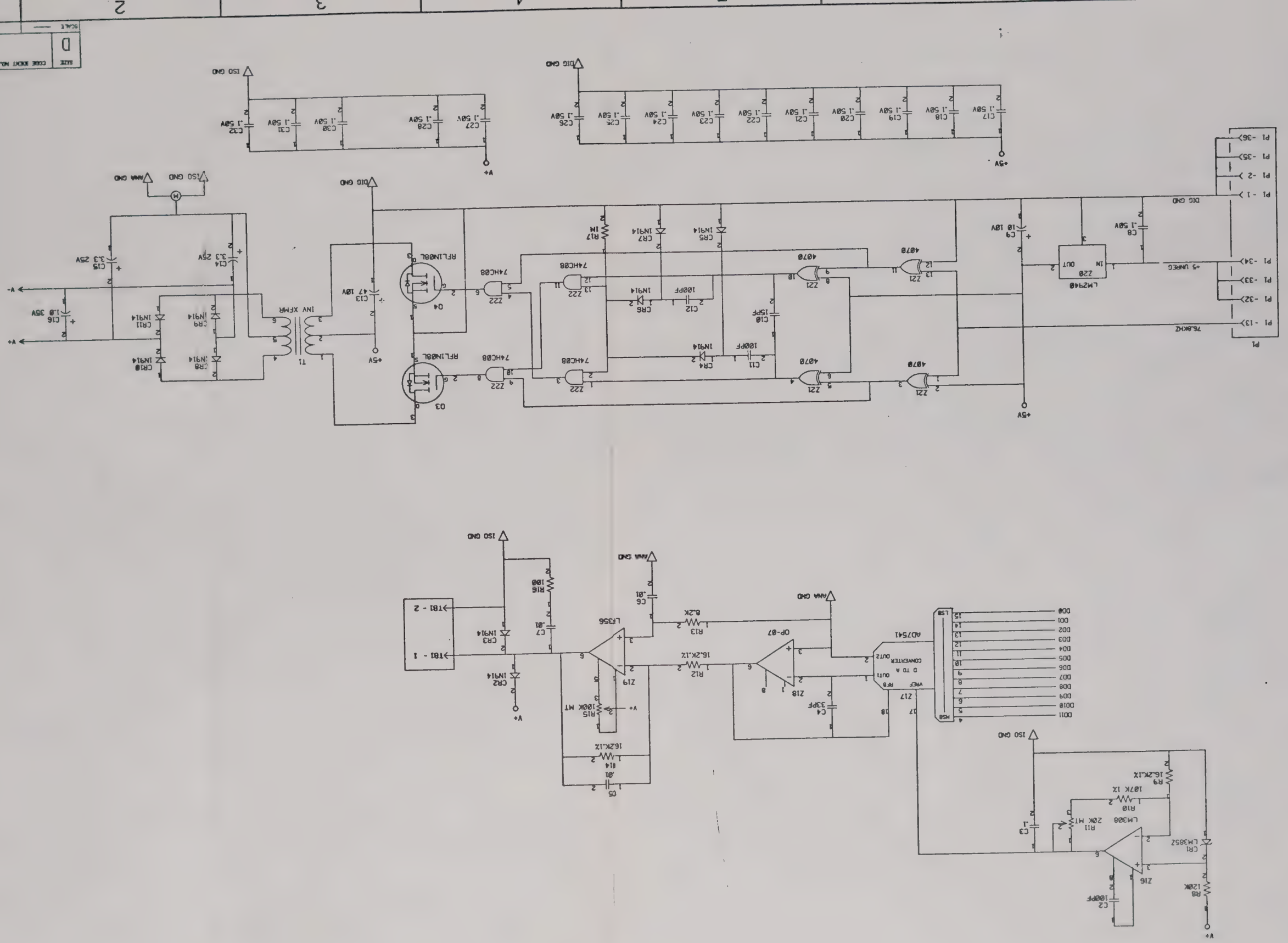
DO NOT SCALE DRAWING — SCALE: — — SHEET 2 OF 3

UNUSED GATES

DIG GND
ISO GND
+5V
V+
DB
+RST*
+EPROM*
+AB*
R/~W*
I/O
EPROM
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
D0
D1
D2
D3
D4
D5
D6
D7
P1 -3
P1 -4
P1 -5
P1 -6
P1 -7
P1 -8
P1 -9
P1 -10
P1 -11
P1 -12
P1 -14
P1 -15
P1 -16
P1 -17
P1 -18
P1 -19
P1 -20
P1 -21
P1 -22
P1 -27
C33 .1 50V
C34 .01 50V
C35 220 PF
R1 180
R2 15K
R3 100K
R4 180
R5 15K
R6 100K
R18 100K
R19 100K
Q1 PN2907
Q2 PN2907
Z1 81IN/OCT
Z4 74HC373
Z5 74HC32
Z6 EPROM 8192 x 8
Z7 74HC20
Z8 74HC74
Z9 6N135
Z10 6N135
Z11 74C04
Z12 4538
Z13 4066
Z14 SRG8
Z15 SRG8
Z22 74HC04
Z23 74HC30
Z24 74HC138
Z25 605-7050
4094
4538
74HC04
74HC20
74HC30
74HC32
74HC73
74HC74
74HC138
605-7050
81IN/OCT
EPROM 8192 x 8
SRG8
RX/CX
EN
CLR
CLK
CI
CO
D
Q
R
S
C
A
B
1
2
3
4
5
6
7
8
C
D

SIZE	CODE IDENT NO.	DRAWING NO.	SHEET
D		605-6470-00	B

SCALE —— DO NOT SCALE DRAWING SHEET 3 OF 3



1	2	3	4	5	6	7	8

ZONE	LAL	REV	DESCRIPTION	CHECKED	APPROVED
		A1	[illegible]	[illegible]	[illegible]
		A	[illegible]	[illegible]	[illegible]
		B	[illegible]	[illegible]	[illegible]
		C	[illegible]	[illegible]	[illegible]
		D	[illegible]	[illegible]	[illegible]
		E	REVISED PER E.O. 2-11807	8/7	[illegible]

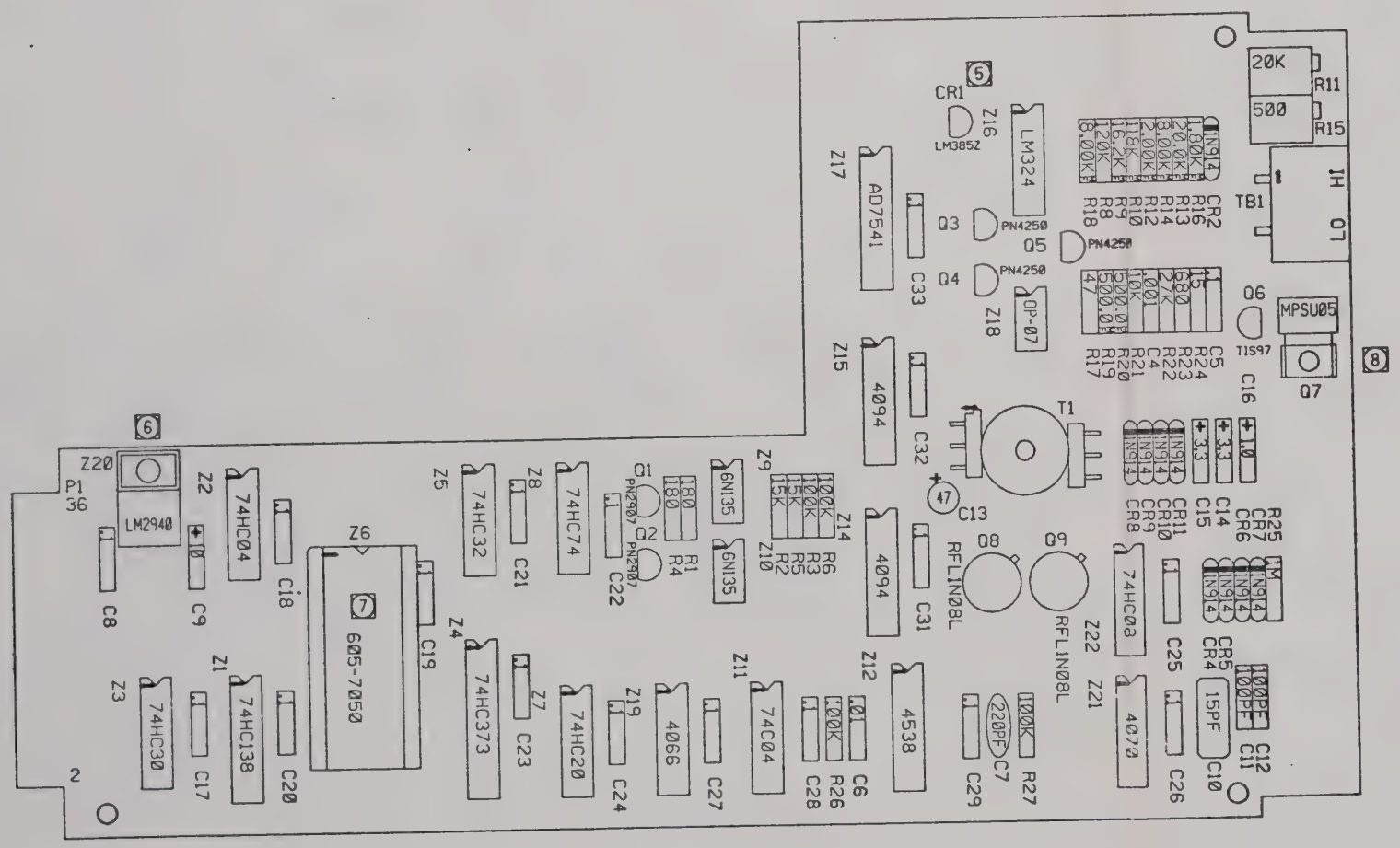
[6] INSTALL REGULATOR (ITEM 50) WITH SCREW (ITEM 58) AND TINNERMAN FASTENER (ITEM 59). SCREW HEAD TO BE ON FAR (SOLDER) SIDE OF BOARD.

[7] INSTALL IC SOCKET (ITEM 60), INSTALL IC Z6 INTO SOCKET.

[8] INSTALL TRANSISTOR (ITEM 48) WITH SCREW (ITEM 58), TINNERMAN FASTENER (ITEM 59), AND NYLON WASHER (ITEM 61). WASHER IS INSTALLED BETWEEN TRANSISTOR AND PCB. SCREW HEAD TO BE ON FAR (SOLDER) SIDE OF BOARD.

NOTES: UNLESS OTHERWISE SPECIFIED

1. THIS UNIT TO BE ASSEMBLED TO DORIC SPEC 000-1003.
2. RESISTANCE IS IN OHMS.
3. CAPACITANCE IS IN MICROFARADS.
4. FOR MATERIAL LIST, SEE SHEETS 2 THRU 5.
5. RUBBER STAMP ASSEMBLY NO. AND REVISION LETTER WITH .12 HIGH BLACK PERMANENT INK CHARACTERS ON FAR (SOLDER) SIDE.



HOLE TOLERANCES	NOTES UNLESS SPECIFIED				
.000 - .250 DIA +.004 -.002 .251 - .500 DIA +.005 -.002 .501 - 1.00 DIA +.010 -.005	1. TOLERANCES .XX ±.03 DIMENSIONED ANGLES .XXX ±.010 ±1/2° 2. BREAK ALL SHARP EDGES .010 APPROX. 3. MACH. SURFACES √ 4. ALL DIM. IN INCHES 5. ALL TRUE POSITION TOLERANCES APPLY @ MMC	DRAWN	L. OFTEDAHL	5-31-85	DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO, CA 92123
		CHECK	L. OFTEDAHL	6-13-85	TITLE: ASSEMBLY, PCB, ANALOG OUTPUT 4-20MA
SUPERSEDES		APPR.	J. CRABTREE	6-14-85	
		MATERIAL			
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION WHICH SHALL NOT BE REPRODUCED OR TRANSFERRED TO OTHER DOCUMENTS OR DISCLOSED TO OTHERS OR USED FOR MANUFACTURING OR ANY OTHER PURPOSE WITHOUT PRIOR WRITTEN PERMISSION OF DORIC SCIENTIFIC.	USED ON: 600/700 NEXT ASSY: 605-802X-XX	FINISH			SIZE: E; CODE IDENT. NO.; DRAWING NO.: 605-4490-00; CHANGE LETTER: E; SCALE 2:1; DO NOT SCALE DRAWING; SHEET 1 OF 5

4-20 MA

REVISIONS					
LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
	X1	R & D RELEASE	JO	6/17/85	
	A1	LIMITED USAGE RELEASE PER E.O. 2-11600	DH	8/30/85	
	B	PRODUCTION RELEASE PER E.O. 2-11656	LV	12/18/85	
	C	REVISED PER E.O. 2-11719	HL	5/7/86	
	D	REVISED PER E.O. 2-11750	HL	5/7/86	
	E	REVISED PER E.O. 2-11807	HL	7/28/86	

NOTE: SHEET 1 IS ASSEMBLY DRAWING.

NOTES UNLESS SPECIFIED			
1. TOLERANCES .xx ± .03 DIMENSIONED .xxx ± .010 ANGLES ± ½°	DRAWN	L.OFTEDAHL	9/7/85
2. BREAK ALL SHARP EDGES .010 APPROX.	CHECK	J.Oftedahl	9/17/85
3. MACH. SURFACES √	APPR.		9/14/85
4. ALL DIM. IN INCHES	MATERIAL		
5. ALL TRUE POSITION TOLERANCES APPLY AT MMC			

DORIC DORIC SCIENTIFIC DIVISION • EMERSON ELECTRIC CO.
3883 RUFFIN ROAD • SAN DIEGO, CA 92123

TITLE: ASSY, PCB, ANALOG OUTPUT 4-20mA

USED ON	FINISH	SIZE	DWG NO.	CHANGE LETTER
600/700		A	605-4490-00	E
NEXT ASSY. 605-802X-XX		SCALE:		SHEET 2 OF 5

DORIC - PCB ASSY, ANALOG OUTPUT 4-20MA 605-4490-00 E

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
1	1	600 MEMORY, 2764, ANALOG OPTION	605-7050-01	Z6	605-7050-01	
2						
3	1	IC, DIG, QUAD BILATERAL SWITCH	4066	Z19	965-587-06	
4	1	IC, DIG, QUAD 2-INPUT EXCLUSIVE OR	4070	Z21	965-587-27	
5	2	IC, DIG, 8-STAGE SHIFT/STORE REGISTER	4094	Z14,Z15	965-587-65	
6	1	IC, DIG, DUAL PRECISION ONE-SHOT	4538	Z12	965-587-72	
7	1	IC DIGITAL HEX INVERTER	74C04	Z11	965-587-05	
8	1	IC, DIG, HEX INVERTER	74HC04	Z2	965-6351-05	
9	1	IC, DIG, QUAD 2-INPUT AND	74HC08	Z22	965-6351-06	
10	1	IC, DIG, 3-TO-8 LINE DECODER	74HC138	Z1	965-6351-11	
11	1	IC, DIG, DUAL 4-INPUT NAND GATE	74HC20	Z7	965-6351-26	
12	1	IC, DIG, 8-INPUT NAND GATE	74HC30	Z3	965-6351-27	
13	1	IC, DIG, QUAD 2-INPUT OR	74HC32	Z5	965-6351-28	
14	1	IC, DIG, OCT D-LATCH TRI-ST OUTPUTS	74HC373	Z4	965-6351-02	
15	1	IC, DIG, DUAL D FLIP-FLOP	74HC74	Z8	965-6351-08	
16	1	IC, 12-BIT D TO A CONV	7541	Z17	965-6360-03	
17	18	CAP AXIAL .1 @ 50V	900-021-08	C17,C18,C19,C20,C21, C22,C23,C24,C25,C26,C27,C28,C29, C31,C32,C33,C5,C8	900-021-08	
18	1	CAP AXIAL .001 @ 50V	900-021-09	C4	900-021-09	
19	2	CAP AXIAL 100PF @ 50V	900-021-13	C11,C12	900-021-13	
20	1	CAP MICA RADIAL 15PF @ 500V DM15	915-031-50	C10	915-031-50	

DORIC - PCB ASSY, ANALOG OUTPUT 4-20MA 605-4490-00 E

Item No.	Qtw Read	Description / Identification		Reference Designation	Part Number	See Note
21	1	CAP TANT AXIAL 10 @ 10V (162D)	916-010-10	C9	916-010-10	
22	1	CAP ELECT RADIAL 47 @ 10V	919-1000-06	C13	919-1000-06	
23	1	RES MF RN55E 1.0% 118K	922-4118-02	R10	922-4118-02	
24	1	RES MF RN55E 0.1% 16.2K	922-416-22	R9	922-416-22	
25	1	RES MF RN55E 0.1% 1.80K	922-4180-00	R16	922-4180-00	
26	1	RES MF RN55E 0.1% 2.00K	922-420-01	R12	922-420-01	
27	2	RES MF RN55E 0.1% 500 OHM	922-450-00	R19,R20	922-450-00	
28	1	RES MF RN55E 0.1% 20.0K	924-202-02	R13	924-202-02	
29	2	RES MF RN55E 1.0% 8.00K	924-280-01	R14,R18	924-280-01	
30	1	RES CBN 1/4W 5% 10K	942-201-03	R21	942-201-03	
31	4	RES CBN 1/4W 5% 100K	942-201-04	R3,R6,R26,R27	942-201-04	
32	1	RES CBN 1/4W 5% 1M	942-201-05	R25	942-201-05	
33	1	RES CBN 1/4W 5% 120K	942-201-24	R8	942-201-24	
34	1	RES CBN 1/4W 5% 15 OHM	942-201-50	R24	942-201-50	
35	2	RES CBN 1/4W 5% 15K	942-201-53	R2,R5	942-201-53	
36	2	RES CBN 1/4W 5% 180 OHM	942-201-81	R1,R4	942-201-81	
37						
38	1	RES CBN 1/4W 5% 27K	942-202-73	R22	942-202-73	
39	1	RES CBN 1/4W 5% 47 OHM	942-204-70	R17	942-204-70	
40	1	RES CBN 1/4W 5% 680 OHM	942-206-81	R23	942-206-81	
41	1	POT, 20K CERMET M-TURN END ADJ	960-0120-21	R11	960-0120-21	
42	1	POT, 500 OHM CERMET M-TURN END ADJ	960-0150-24	R15	960-0150-24	
43	9	DIODE 1N914 (1N4148)	961-091-40	CR10,CR11,CR2,CR4,CR5,CR6,CR7,CR8,CR9	961-091-40	
44	1	DIODE LM385Z VOLT REF 1.235V	961-385-00	CR1	961-385-00	

Item No.	Qty Read	Description / Identification		Reference Designation	Part Number	See Note
45	2	XSTR 2N2907	962-290-70	Q1,Q2	962-290-70	
46	3	XSTR 2N4250 PNP	962-425-00	Q3,Q4,Q5	962-425-00	
47	2	FET, PWR 1A 80V RFL1N08L	963-1000-07	Q8,Q9	963-1000-07	
48	1	XSTR MPSU05 NPN	964-040-05	Q7	964-040-05	
49	1	XSTR TIS97 NPN	964-040-97	Q6	964-040-97	
50	1	REGULATOR POS 5V LM2940	964-5300-04	Z20	964-5300-04	
51	2	IC, 6N135 OPTO-ISOLATOR	965-570-00	Z10,Z9	965-570-00	
52	1	IC, QUAD OP-AMP LM324	965-599-00	Z16	965-599-00	
53	1	IC OP-07 PREC OPAMP	965-607-00	Z18	965-607-00	
54	1	TRANSFORMER, POWER	967-0050-39	T1	967-0050-39	
55	1	TERM STRIP 2 POS	973-0103-00	TB1	973-0103-00	
56	1	PCB, ANALOG OUTPUT 4-20mA	605-2490-02		605-2490-02	
57	1	SCHEM, ANALOG OUTPUT 4-20mA	605-6490-00		605-6490-00	
58	2	SCREW, PAN HD PHILLIPS, 4-40 X 1/4 LG	980-440-025	(Q7,Z20)	980-440-025	
59	2	FASTENER, SELF-LOCKING, TINNERMAN	991-0201-14	(Q7,Z20)	991-0201-14	
60	1	SOCKET, IC 28 PIN	992-010-85	(Z6)	992-010-85	
61	1	WASHER, FLAT NYLON #4	986-800-00	(Q7)	986-800-00	
62	2	CAP, TANT AXIAL 3.3 @ 25V (162D)	916-033-25	C14,C15	916-033-25	
63	1	CAP, TANT AXIAL 1.0 @ 35V (162D)	916-0010-35	C16	916-0010-35	
64	1	CAP, AXIAL .01 @ 50V	900-021-07	C6	900-021-07	
65	1	CAP, DISC 220pf @ 1000V	901-012-21	C7	901-012-21	

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NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
2. CAPACITOR VALUES ARE IN MICROFARADS.
3. SEE CHART FOR IC PWR AND GND CONNECTIONS.

REVISIONS						
ZONE	LAL	REV	DESCRIPTION	CHECK	DATE	APPROVED
		A	[illegible]	[illegible]	[illegible]	[illegible]
		B	[illegible]	[illegible]	[illegible]	J.CRABTREE
		C	PROD. REL. PER E... # 12006	[illegible]	[illegible]	[illegible]

I.C. POWER CONNECTIONS					
REF DES	I.C. TYPE	PIN & VOLTAGE		PIN & VOLTAGE	
Z1	74HC138	16	+5V	8	DIG GND
Z2	74HC04	14	+5V	7	DIG GND
Z3	74HC30	14	+5V	7	DIG GND
Z4	74HC373	20	+5V	10	DIG GND
Z5	74HC32	14	+5V	7	DIG GND
Z6	605-7050	28	+5V	26	+5V
		1	+5V	14	DIG GND
Z7	74HC20	14	+5V	7	DIG GND
Z8	74HC74	14	+5V	7	DIG GND
Z9	6N135	SEE SCHEMATIC			
Z10	6N135	SEE SCHEMATIC			
Z11	74C04	14	V+	7	ISO GND
Z12	4538	16	V+	8	ISO GND
Z13	UNUSED				
Z14	4094	16	V+	8	ISO GND
Z15	4094	16	V+	8	ISO GND
Z16	LM324	4	V+	11	V-
Z17	AD7541	16	V+	3	ISO GND
Z18	OP-07	7	V+	4	V-
Z19	4066	14	+5V	7	DIG GND
Z20	LM2940	SEE SCHEMATIC			
Z21	4070	14	+5V	7	DIG GND
Z22	74HC08	14	+5V	7	DIG GND

REFERENCE DESIGNATORS		
REF DESIG	LAST USED	NOT USED
INT CKT	Z22	Z13
TRANSISTOR	Q9	
DIODE	CR11	CR3
RESISTOR	R27	R7
CAPACITOR	C33	C1,C2,C3,C30
XFORMER	T1	
TERM BLOCK	TB1	
CONNECTOR	P1	

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ASSY.NO. 605-4490-XX	SUPERSEDES		
	DRAWN	S. DUONG	5-31-85
	CHECK	R.E.G.	6-12-85
	DES/ENG	R.E. GRIPPEN	6-12-85
	APPR.	J. CRABTREE	6-12-85

DORIC DORIC SCIENTIFIC DIVISION EMERSON ELECTRIC CO. 3883 RUFFIN ROAD SAN DIEGO,CA 92123

TITLE: SCHEMATIC, ANALOG OUTPUT 4-20 MA

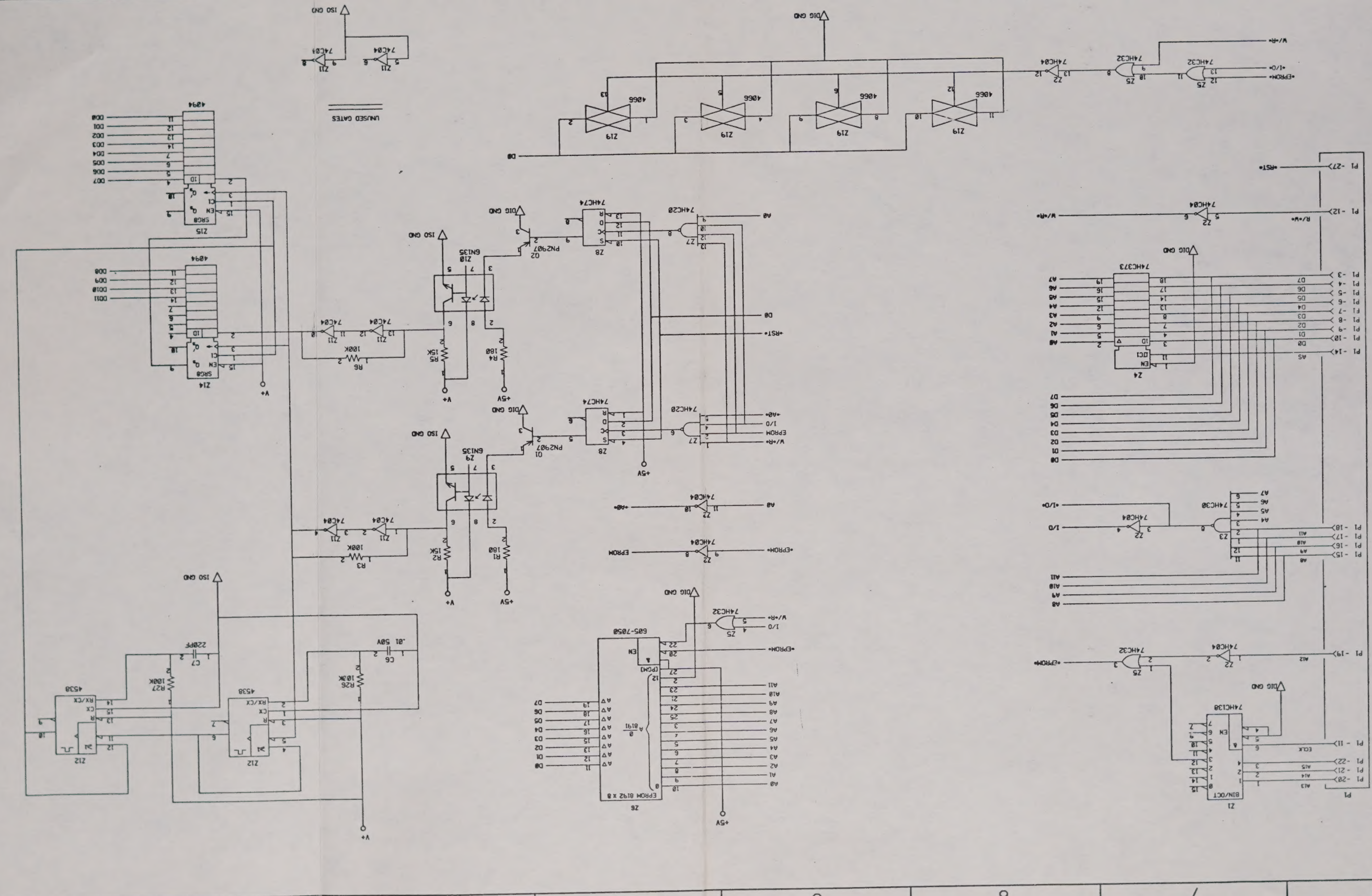
SIZE: D | DRAWING NO.: 605-6490-00 | CHANGE LETTER: B

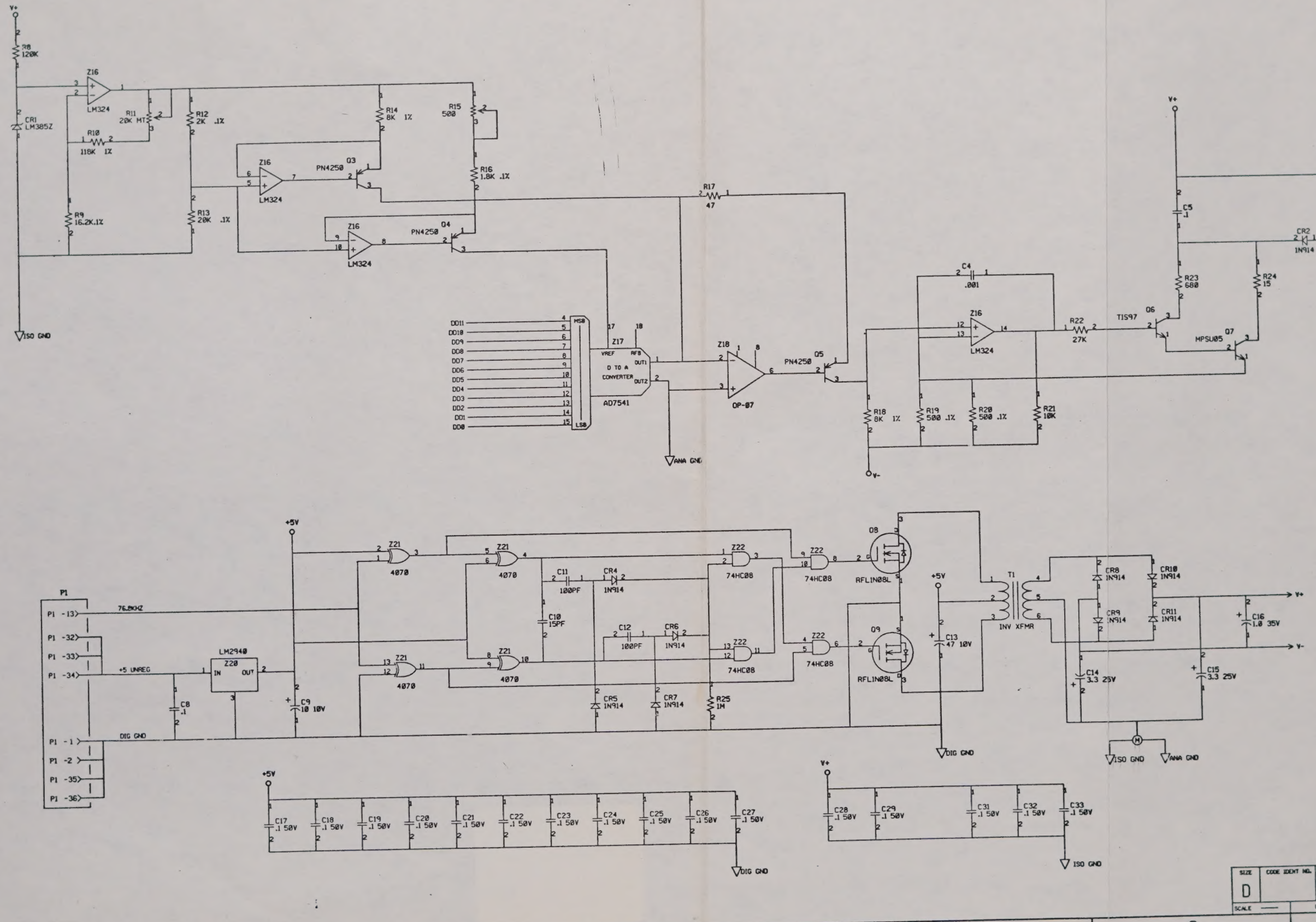
SCALE: —— | DO NOT SCALE DRAWING | SHEET 1 OF 3

SIZE	CODE IDENT NO.	DRAWING NO.	SHEET 2 OF 3
D		605-6490-00	B

SCALE —— DO NOT SCALE DRAWING

UNUSED GATES





SIZE	CODE IDENT NO.	DRAWING NO.	DRAWING LETTER
D		605-6490-00	B
SCALE —	DO NOT SCALE DRAWING	SHEET 3 OF 3	

MP MASTER
MA25567